Date : 28.07.2022

To,
The Deputy Registrar,
Academic Section,
Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad.

Subject : Submission of B.Sc. – I year Physics Syllabus effective from academic year 2022-23.

Respected Sir,

Here with, I am submitting Physics Syllabus from the year 2022-23 Prepared by BOS in Physics.

Kindly accept syllabus PDF file.

Thanking you,

Yours Faithfully

Dr. D. R. Shengule
Chairman
BOS
Physics.

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad

Physics Syllabus

Choice Based Credit System

B.Sc. F.Y.

Semester I & II

Effective From

Academic Year 2022-23

B. Sc. I Year Physics Syllabus
Choice Based Credit System Syllabus
To be implemented from Academic Year 2022-2023

Title of the Course: B.Sc. (Physics)

Preamble:

The curriculum for the B. Sc. (Physics) programme is designed to cater to the requirement of Choice Based Credit System following the University Grants Commission (UGC) guidelines. In the proposed structure, due consideration is given to Core and Elective Courses (Discipline specific - Physics), along with Ability Enhancement (Compulsory and Skill based) Courses. Furthermore, continuous assessment is an integral part of the CBCS, which will facilitate systematic and thorough learning towards better understanding of the subject. The systematic and planned curricula from first year to the third year (comprised of six semesters) shall motivate the student for pursuing higher studies in Physics and inculcate enough skills for becoming an entrepreneur.

Objectives:

- To foster scientific attitude, provide in-depth knowledge of scientific and technological concepts of Physics.
- To enrich knowledge through problem solving, minor/major projects, seminars, tutorials, review of research articles/papers, participation in scientific events, study visits, etc.
- To familiarize with recent scientific and technological developments
- To create foundation for research and development in Physics.
- To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems.
- To train students in skills related to research, education, industry, and market.
- To help students to build-up a progressive and successful career in Physics.

Structure of the Course:

Subject Name	Year	Semester	Course Type	Course Code	Course Name	Credit
Physics	1	I	Compulsory Course	PHY-111	Mechanics and Properties of Matter	2
				PHY-112	Heat and Thermodynamics	2
				PHY-121	Lab Course - I	1.5
		II	Compulsory Course	PHY-211	Geometrical and Physical Optics	2
				PHY-212	Electricity and Magnetism	2
				PHY-221	Lab Course - II	1.5

Learning Outcomes:

On successful completion of this course students will be able to:

1. Understand Newton's laws and apply them in calculations of the motion of simple systems.
2. Use the free body diagrams to analyze the forces on the object.
3. Understand the concepts of friction and the concepts of elasticity, fluid mechanics andbe able to perform calculations using them.
4. Apply the laws of thermodynamics to formulate the relations necessary to analyzea thermodynamic process.
5. Demonstrate quantitative problem solving skills in all the topics covered

B. Sc. I Year Physics (Semester-I)
(Mechanics and Properties of Matter)
Course Code – Phy111 Paper – I

Periods – 45 Marks – 50

1. Mechanics: - 13 periods

Newton's law of Gravitation (Statement only) , Gravitational Field , Gravitational Potential, Gravitational Potential of mass, Gravitational potential and field due to spherical shell and solid sphere (at a point, outside , inside and on the surface).
Compound Pendulum- expression of time period, Interchangeability of centre of suspension and oscillation, Kater's Pendulum.

2. Elasticity: - 10 periods

Introduction , Stress and Strain, Hook's law and Coefficient of elasticity, Young's modulus, Bulk modulus, Modulus of rigidity, Twisting couple on a cylinder, Bending of Beam – Bending moment, cantilever loaded at free end – (a) When weight of beam is ineffective, (b) When weight of beam is effective, Depression of Beam supported at centre

3. Viscosity 12 Periods

Introduction, Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity, energy of liquid in motion, Bernoulli's Theorem, practical applications: (i) Law of hydrostatic pressure (ii) Filter pump.

4. Surface Tension 10 Periods

Introduction, Angle of contact, Factors affecting surface tension Difference of pressure across a curved surface, Determination of S.T. by Jaeger's method, Applications of surface tension.

References:-

1) Elements of Properties of Matter – D. S. Mathur
(S. Chand , 11 th edition , 1992)
2) Physics for Degree students – C. L. Arora and P.S.Heme
(S. Chand , I st edition 2010)
3) Mechanics and Electrodynamics – Brijlal ,N. Subrahmanyam , Jivan Seshan

(S.Chand , 7 th edition)

4) Concepts of Physics: H. C. Verma, BharatiBhavan Publisher.

5) University Physics : Sears and Zeemansky, XIth/XIIth Edition, Pearson Education.

B. Sc. I Year Physics (Semester-I)
(Heat and Thermodynamics)
Course Code – Phy112 Paper – II

Periods – 45 Marks – 50

1) Thermometry and Thermal Conductivity: 10 periods

Types of thermometers, Principle of thermometry, centigrade and Fahrenheit scale,
Transference of heat, Coefficient of thermal conductivity, Rectilinear flow of heat along a metal bar, Methods of radial flow of heat-(i)spherical shell method and (ii)Flow of heat along the wall of a cylindrical tube, comparison of conductivities of different metals.

2) Real Gases 10 periods

Introduction, Equation of state Reason for modification of gas equation, Van der Waals equation of state , Zeroth law of thermodynamics, comparison with experimental curves, critical constants, constants of Van der Waals equation.

3) Transport phenomena– 12 periods

Introduction, Mean free path, sphere of influence, and expression for mean free path, variation of mean free path with temperature and pressure, transport phenomena, viscosity, Thermal conductivity (their interrelationship, dependence on temperature and pressure).

4) Thermodynamics: - 13 periods

Adiabatic process, Adiabatic equation of a perfect gas, Isothermal process, Indicator diagram, work done during isothermal process and adiabatic process, reversible and irreversible process, Second law of thermodynamics. (Kelvin and Clausius statement), Heat engines, Carnot's ideal heat engine, Carnot's cycle (work done and Efficiency).

Reference Books:-

1) Heat Thermodynamics and Statistical Physics - Brijlal, N.Subrahmanyan , P.S. Heme (S.Chand , 2007 Edition) .
2) Text Book of Heat and Thermodynamics–J. B. Rajam, C.L. Arora (S. Chand, 9th Edition)
3) Heat and Thermodynamics– S. S. Singhal, J. P. Agarwala, S.Prakash (Pragati Prakashan)
4) Thermodynamics & Statistical physics-S. L. Kakani

B. Sc. I Semester
Physics paper III (Phy113)
List of experiment

.

1. Study and use of various measuring Instruments

   1. Vernier caliper 2. Micrometer Screw Gauge 3. Travelling Microscope

   4. Spherometer 5. Spectrometer information about source and their wavelengths.

2. Determination of acceleration due to gravity by Kater's pendulum

3. Y by bending of a beam loaded at center.

4. Determination of Y by Cantilever (Oscillation method)

5. η by Maxwell's needle.

6. Determination of "Y" and "η" by flat spiral spring.
7. Viscosity measurement by Poiseuille's method.
8. S.I. by Jaeger's method.
9. Study of Solar constant.
10. Study of thermal conductivity by Lee's method

Note: - At least six experiments should be performed.

Learning Outcomes:

On successful completion of this course learner will be able to……

1. Understand the concepts of Physical and Geometrical optics.
2. Familiarize with optical instruments and lens aberrations.
3. Comprehend interference and diffraction of light.
4. Understand polarization of light.
5. Know the concepts of the electric force, electric field and electric potential for stationary charges.
6. Able to calculate electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law.
7. Understand the dielectric phenomenon and effect of electric field on dielectric.
8. Learn magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws.
9. Study magnetic materials and its properties.
10. Demonstrate quantitative problem-solving skills in all the topics covered.

B. Sc. I Year Physics (Semester-II)
(Geometrical and Physical Optics)
Course Code – PHY-211
Paper – IV

Periods – 45 **Marks – 50**

1) Optical system and Cardinal points: - **10 periods**

Conjugate points, planes and distances, Lateral magnification, Longitudinal magnification and Angular magnification, Cardinal points of optical system - Focal points, Principal points, Nodal points and corresponding planes, coaxial lens system - equivalent focal length and cardinal points.

2) Optical instruments: - **12 periods**

Lens Aberrations - Monochromatic and Chromatic, Field of view, Stops and pupils, Objective and eyepiece, Need of multiple lens eye piece, Huygens's Eyepiece, Ramsden's eyepiece.

3) Interference and Diffraction: - **12 periods**

Interference: Newton's rings, Determination of wavelength of sodium light, Michelson's Interferometer - Idea of form of fringes (No theory required), determination of wavelength and difference in wavelength.

Diffraction: Types of diffraction, Fraunhofer diffraction due to single and double slit, Plane diffraction grating, Determination of wavelength by plane diffraction grating (Normal incidence), Rayleigh's criterion for resolution, Resolving power of telescope and grating.

4) Polarization: - **11 periods**

Polarized and unpolarized light, Malus law, Brewster's law, Double refraction, Huygens's theory of double refraction in uniaxial crystal, Nicol prism, Optical activity, Fresnel's explanation of optical rotation, specific Rotation, Laurentz's half shade polarimeter.

Reference Books:-

1) Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
2) A text book of optics- Brijlal and Subrahmanyam(S.Chand & Co.)
3) Optics and Spectroscopy - R.Murugeshan, K.Sivaprasath(S.Chand, 7th Revised Edition)

4) Optics(Second Edition) - A.K.Ghatak
5) Geometrical & Physical Optics - D.S.Mathur
6) Optics and Atomic Physics- D.P.Khandelwal (Himalaya Publishing House)
7) Geometrical and Physical Optics, P K Chakraborty, New Central Book Agency

B. Sc. I Year Physics (Semester-II)
Course Code – PHY-212 (Electricity and Magnetism)

Paper – V

Periods – 45 **Marks – 50**

1. Vector Algebra: - **15 periods**

Scalar and vector product, scalar triple product and it's geometrical interpretation, vector triple product, gradient, divergence and curl and it's physical interpretation, line, surface and volume integrals, Gauss divergence theorem and Stoke's theorem.

2. Electrostatics: - **10 periods**

Coulomb's Law, Electric field, field due to a point charge, flux of electric field, Gauss's law (with proof), Differential form of Gauss law, electric potential, potential due to a point charge, Potential and field due to electric dipole.

3. Dielectrics: - **08 periods**

Dielectric, polar and non-polar molecules, dielectric polarization, Gauss's law in dielectrics, Relation between D, E and P, molecular field in a dielectric (Clausius-Mossotti relation).

4. Magnetostatics: - **12 periods**

Magnetic field, Magnetic induction, Magnetic flux, Biot-Savart law, Magnetic induction due to straight conductor carrying current and circular coil, magnetic induction on the axis of solenoid, Ampere's Law, Differential form Ampere's Law, Moving coil ballistic Galvanometer- expression for charge.

References:

1. Mathematical Methods in Physics- D. Biswas (New central book agency, 2009 edition).
2. Electricity and Magnetism- R. Murugeshan (S. Chand, 2008 edition).
3. Electrodynamics- Gupta, Kumar, Singh (Pragati Prakashan, Meerut, 18th edition, 2005)

4. Foundations of Electromagnetic theory- Reitz, Milford, Chirstey IIIrd edition.
5. Fundamentals of Physics- Halliday Resnik and Walkar, 8th Edition.
6. Electromagnetics- B. B. Laud.
7. Electricity and Magnetism- BrijLal, Subramanyan, RatanPrakashan (Revised edition, 1997).
8. Electricity and Magnetism- Edward M. Purcell, 1986, McGraw-Hill Education.
9. Electricity and Magnetism- D C Tayal, 1988, Himalaya Publishing House.

B. Sc. II Semester
Physics paper VI (PHY-221)
List of experiment

1. Use of multimeter for measuring voltage, current and resistance.
2. Determination of dielectric constant of liquid / solid.
3. I-H curve.
4. Field along the axis of circular coil.
5. Determination of wavelength of light by Newton's rings.
6. Resolving power of telescope.
7. Specific rotation by Laurent's half shade polarimeter.
8. λ by grating (normal incidence)
9. Determination of frequency of AC mains by sonometer
10. Comparison of capacitor using De'Sauty's method
11. Measurement of constants of B. G.

Note: - At least six experiments should be performed.

PHYSICS

Time: 2.30 Hours ***[Max. Marks: 50]***

NOTE: 1. All Questions carry equal marks
2. Use of logarithmic table and electronic pocket calculator is allowed.

Q1 Chapt.I (Long question) 10 marks

OR

Chapt.II (Long question)

Q2 Chapt.III (Long question) 10 marks

OR

Chapt.IV (Long question)

Q3 a) Chapt. I (short question) 10 marks
b) Chapt. II (short question)

OR

a) Chapt.III (short question)
b) Chapt.IV (short question)

Q4. Attempt any two 10 marks

a) Chapter I Problem
b) Chapter II Problem
c) Chapter III Problem
d) Chapter IV Problem

Q 5 MCQ 10 marks

Ten MCQ's having four alternatives based on theory and numerical.
(Minimum two MCQ's from each chapter)