JAI HIND COLLEGE
BASANTSING INSTITUTE OF SCIENCE
&
J.T.LALVANI COLLEGE OF COMMERCE
(AUTONOMOUS)

"A" Road, Churchgate, Mumbai - 400 020, India.

Affiliated to
University of Mumbai

Program : BSc

Proposed Course : Physics

Semester I

Credit Based Semester and Grading System (CBCS) with effect from the academic year 2020-21

F.Y. B.Sc. Physics Syllabus

Academic year 2020-2021

Semester I			
Course Code	**Course Title**	**Credits**	**Lectures /Week**
SPHY101	Mechanics and Thermodynamics- I	2	3
SPHY102	Vector Calculus-I and Modern Physics	2	3
SPHY1PR	Practical – I	2	6

Semester I Course I

Course Code: SPHY101	Mechanics and Thermodynamics- I (Credits: 2, Lecture/week: 3)	
	Course description: To study the fundamentals of Mechanics and Thermodynamics. **Objectives** 1. To understand applications of Newton's laws to classical systems. 2. To understand the concepts of elasticity and viscosity 3. To apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process	
	THEORY	**(45 lectures)**
Sub Unit	**Unit – I: Mechanics**	**15 L**
1.	**Newton's laws of motion** Newton's first and second law and their explanation, Working with Newton's first and second law, Newton's third law and its explanation.	2
2.	**Applying Newton's laws** Using Newton's first law: Particles in equilibrium, Using Newton's second law: Dynamics of particles, Frictional forces, Dynamics of circular motion, The fundamental forces of nature, typical examples such as block on table/ incline, Pulley, Lift etc.	7
3.	**Work and Energy** Kinetic energy, Work and work energy theorem, Calculation of work done with Constant force, Variable force, Illustration, Conservative and nonconservative forces	2
4.	**Rotation of rigid bodies** Angular velocity and acceleration, rotation with constant angular acceleration, relating linear and angular kinematics, Energy in rotational motion, moment of inertia calculations, Problems	4
	Unit – II: Mechanics	**15 l**
1.	**Elasticity:** Review of Elastic constants Y, K, η and σ; Equivalence of shear strain to compression and extension strains. Relations between elastic constants, Couple for twist in cylinder	7
2.	**Fluid Dynamics:** Equation of continuity, Bernoulli's equation, applications of Bernoulli's equation, streamline and turbulent flow, lines of flow in airfoil, Poiseuille's equation	8
	Unit – III: Thermodynamics	**15 L**
1.	**Thermodynamics:** Andrews experiment, Behaviour of real gases and real gas equation, Boyle's law, Van der Waal equation,	5
2.	Thermodynamic Systems, Zeroth law of thermodynamics, Concept of Heat, The first law, Non Adiabatic process and Heat as a path function, Internal energy, , Heat Capacity and specific heat, Applications of first law to simple processes, general relations from the first law, Indicator diagrams, Work done during isothermal and adiabatic processes, Worked examples, Problems.	10

ICA (Internal Continuous Assessment)	Class test, Seminars, Assignments, Class performance
References:	1. B. K. Guha, (2007), *Degree Physics for Science and Engineering*, Asian Books private limited. 2. Halliday, Resnick and Walker, (9th Edition 2010), *Fundamental of Physics (extended)*, John Wiley and Sons. 3. H.S. Hans and S.P. Puri, *Mechanics*, (2nd Edition 2008), Tata Mcgraw Hill. 4. A. B. Gupta, H. Roy, (2009), *Thermal Physics*, Tata Mc Graw Hill. 5. H. C. Verma, (2002), *Concepts of Physics (Part I)*, Bharati Bhavan Publishers. 6. Brijlal, Subramanyam and Hemne, (Multi-coloured, 2007), *Heat Thermodynamics and Statistical Physics*, S. Chand publications.

Course II

Course Code: SPHY102	**Vector Calculus- I and Modern Physics (Credits: 2, Lecture/week: 3)**	
	Course description : To study the basics of Mathematical Physics and to introduce concepts of modern physics **Objectives** 1. To understand the basic mathematical concepts and their applications in physical situations. 2. To develop quantitative problem solving skills in all the topics covered. 3. To understand properties of the nucleus. 4. To understand basic concepts of quantum physics.	
	THEORY	**(45 lectures)**
Sub Unit	**Unit – I: Vector Algebra and Calculus**	**15 L**
1.	**Vector Algebra**: Vectors, Scalars, Vector algebra, Laws of Vector algebra, Unit vector, Rectangular unit vectors, Components of a vector, Scalar fields, Vector fields, Problems based on Vector algebra. Dot or Scalar product, Cross or Vector product, Commutative and Distributive Laws, Scalar Triple product, Vector Triple product (Omit proofs). Problems and applications based on Dot, Cross and Triple products.	6
2.	**Vector Calculus:** Gradient, divergence and curl: The ∇ operator, Definitions and physical significance of Gradient, Divergence and Curl; Distributive Laws for Gradient, Divergence and Curl (Omit proofs); Problems based on Gradient, Divergence and Curl	9
	Unit – II: Nuclear Physics	**15 L**
1.	**Structure of Nuclei:** Basic properties of nuclei, Composition, Charge, Size, Rutherford's expt. for estimation of nuclear size, density of nucleus, Mass defect and Binding energy, Packing fraction, BE/A vs A plot, stability of nuclei (N Vs Z plot) and problems.	9
	Radioactivity: Radioactive disintegration concept of natural and artificial radioactivity, Properties of α, β, γ-rays, laws of radioactive decay, half-life, mean life (derivation not required), units of radioactivity, successive disintegration and equilibriums, radioisotopes, carbon dating, age of earth, Numerical Problems	6
	Unit – III: Modern Physics	**15 lectures**
1.	**Introduction to Quantum theory:** Black body (definition), Black Body spectrum, Wien's displacement law, Matter waves, wave particle duality, Heisenberg's uncertainty Principle. Davisson-Germer experiment, G. P. Thompson experiment.	7

2.	**X-Rays:** Production and properties. Continuous and characteristic X-Ray spectra, X-Ray Diffraction, Bragg's Law, Applications of X-Rays.	4
3.	**Interaction of photon with matter:** Compton Effect, Pair production, Photons and Gravity, Gravitational Red Shift.	4
ICA (Internal Continuous Assessment)	Class test, Seminars, Assignments, Class performance	
References:	1. H.K.Dass,2018, *Mathematical Physics*, S Chand Publications 2. Dr. S. B. Patel, (Reprint 2009) ,*Nuclear physics*, New Age International Pvt Ltd Publishers. 3. Beiser, (2017), *Concepts of Modern Physics*, McGraw Hill Education.	

Course Code: SPHY1PR	Practical-I	2 Credits
Learning Objectives:	**1.** To correlate theory concepts. 2. To develop basic experimental skills through conduct of experiments.	

SEMESTER-I PRACTICALS

Skills

1. Use of Vernier calliper, micro meter screw gauge
2. Use of spectrometer
3. Use of Travelling microscope
4. Estimation of errors and graph plotting

Experiments (Any 8)

1. Torsional oscillations
2. Bifilar pendulum
3. Angle of prism
1. Y by vibrations
2. Surface tension by capillary rise
3. Refractive index of material of prism using spectrometer
4. CVAT
5. Flywheel
6. Flat spiral spring (Determination of Y)
7. Refractive index of water using Laser light

ICA (Internal Continuous Assessment)	1. Continuous practical evaluation /seminar / 2. Journal Report and Viva-voce.

Students will come for two turns of two and half hours each per week for the laboratory session (Performing practical).

i) Skill experiments: All 4 skill experiments mentioned are compulsory. Students are required to acquire these skills and enter details in their journal.

ii) Regular Physics Experiments: A minimum of **08** experiments from the practical course are to be performed and reported in the journal.

The certified journal must contain all 4 skills and a minimum of **08** regular experiments,

Evaluation Scheme

[A] Evaluation scheme for Theory courses SPHY101 and SPHY102

- **Continuous Assessment (C.A.) - 40 Marks**
  - C.A.-I : Test – 20 Marks of 40 mins. Duration
  - C.A. –II: Assignment of problems/seminars/class performance
- **Semester End Examination (SEE)- 60 Marks**

[B] Evaluation scheme for Practical courses

Total marks : 100					
Continuous Internal Assessment (CIA) **40% (40 marks)**			**Semester End Examination (SEE)** **60% (60 marks)**		**Total**
Rough journal	**Journal**	**Viva-Voice**	**Exp -I**	**Exp- II**	**Total**
20	**10**	**10**	**30**	**30**	**100**

Practical examination will be for a total duration of 4 hours. Students will perform 2 experiments of 2 hours each.

Note: Certified journal is a must for the student to appear for practical examination