Approved by 102nd Academic C

GENERAL NOTES ON THE SYLLABUS

1. The duration of examination for each theory paper will be of three hours.
2. Marks distribution for different papers will be as follows:

Paper	Marks	Questions
PHY01(T)	FULL MARKS: 100 END SEMESTER EXAMINATION : 75 INTERNAL ASSESMENT :25	10 OUT OF 15 QUESTIONS (EACH CARRYING 7½ MARKS)
PHY02(T) PHY03(T) PHY04(T)	FULL MARKS: 75 END SEMESTER EXAMINATION : 56 INTERNAL ASSESSMENT : 19	8 OUT OF 12 QUESTIONS (EACH CARRYING 7 MARKS)
PHY02(P) PHY03(P) PHY04(P)	FULL MARKS: 25 END SEMESTER EXAMINATION: 19 INTERNAL ASSESSMENT : 06	ONE EXPERIMENT TO BE PERFORMED
PHY05(T-A) PHY05(T-B) PHY06(T-A) PHY06(T-B)	FULL MARKS: 75 END SEMESTER EXAMINATION : 56 INTERNAL ASSESSMENT : 19	ONE COMPULSORY PROBLEM ORIENTED QUESTION CARRYING 8 MARKS AND 4 OTHER QUESTIONS FROM THE REMAINING 7 QUESTIONS EACH CARRYING 12 MARKS.
PHY05(P) PHY06(P)	FULL MARKS: 50 END SEMESTER: 37 INTERNAL ASSESSMENT: 13	ONE EXPERIMENT TO BE PERFORMED

3. The Practical Examination for II-IV semesters i.e. PHY02(P), PHY03(P) and PHY04(P) will be of **four hours** duration and each student has to perform one experiment in the examination. Practical Examination for V and VI semesters i.e. PHY05(P) and PHY06(P) will be of **six hours** duration and each student has to perform one experiment in the examination.
4. Internal Assessments: Internal Assessments in theory paper will be based on (i) sessional test, (ii) assignments or any other method of evaluation such as study tour/field trip, wherever possible.
5. Internal Assessments in practical paper will be based on (i) performance in the laboratory work and (ii) number of practical completed during class hours.
6. Preferably SI system should be followed. However, in Nuclear Physics the relevant units may also be followed.
7. One tutorial class per week to develop problem solving skill.
8. Error calculations to be used in experiments where ever applicable.
9. ~~Questions to be set in proportion to the number of lectures assigned in the syllabus.~~

1. **SEMESTER-I**

(i) PHY01(T): Mathematical Physics-I, Mechanics, Waves and Acoustics (Lectures:120: Full Marks:100)

2. **SEMESTER-II**

(i) PHY02(T): Electromagnetism, Electronics – I (Lectures:90; Full marks:75)
(ii) PHY02(P): Experimental Physics-I (Full Marks:25)

3. **SEMESTER-III**

(i) PHY03(T): Thermal Physics, Optics (Lectures:90; Full marks:75)
(ii) PHY03(P): Experimental Physics-II (Full Marks:25)

4. **SEMESTER-IV**

(i) PHY04(T): Special Theory of Relativity, Quantum Mechanics –I, Atomic Physics-I, Nuclear Physics-I and Solid State Physics-I (Lectures:90; Full marks:75)
(ii) PHY04(P): Experimental Physics-III (Full Marks:25)

5. **SEMESTER-V**

(i) PHY05(T-A): Mathematic Physics-II, Quantum Mechanics-II (Lectures:120; Full marks:75)
(ii) PHY05(T-B): Classical Mechanics, Electrodynamics, Statistical Physics, Energy Sources (Lectures:120; Full Marks:75)
(iii) PHY05(P): Experimental Physics-IV (Full Marks:50)

6. **SEMESTER-VI**

(i) PHY06(T-A): Solid State Physics-II, Electronics-II and Fortran Programming (Lectures:120; Full marks:75)
(ii) PHY06(T-B): Atomic Physics-II, Molecular Spectroscopy, Nuclear Physics –II, Astrophysics (Lectures:120; Full Marks:75)
(iii) PHY06(P): Experimental Physics-V (Full Marks:50)

PHY01(T)

SEM Mathematical Physics-I, Mechanics, Waves and Acoustics
ESTE (Lectures:120)
R-I (Full Marks: 100)

UNIT-I (15 Lectures)

Vectors: Vector and Scalar product. Gradient, divergence, curl and their significance. Gauss' divergence theorem, Stokes' theorem, Green's theorem and their significance. (without proofs), unit vectors in polar coordinate.

Ordinary Differential Equations: 1st order homogeneous differential equations, 2nd order differential equations with constant coefficients.

Unit II (25 Lectures)

Inertial and Non-inertial frames: Components of velocity and acceleration in different co-ordinate systems (2D motion only). Uniformly rotating frame, centripetal force and coriolis force with applications.

Central forces: Conservative nature of central forces, Gravitational Force. Newton's Law of Gravitation. Satellite in circular orbit and applications. Geosynchronous Satellite. Basic idea of Global Positioning System (GPS).

Systems of particles: Centre of Mass(CM) and CM frame of reference. Motion of the centre of mass, linear momentum and angular momentum of system of particles. Elastic and inelastic collisions, loss of kinetic energy due to direct impact of inelastic collision of two rigid bodies.

UNIT-III (30 Lectures)

Rigid body motion: Moment of inertia – parallel and perpendicular axes theorems, moment of inertia of a shell, solid sphere, disk and cylinder about axis of symmetry. Euler's equations for force free motion of rigid bodies.

Elasticity: Hooke's law, elastic constants for an isotropic solid, inter relationship of elastic constants, torsion of cylinder, bending of beams, cantilever (weightless) supporting weights at free ends, beam supported at both ends.

Fluids: Equation of continuity for fluids, Bernoulli's theorem (with proof and applications), fluid motion through a capillary tube (streamline flow), Poiseuille's equation, surface tension, capillarity and formation of droplets, pressure on the curved surface of a liquid, excess pressure inside an air bubble.

UNIT IV (30 Lectures)

Simple harmonic motion: Superposition of two SHM's acting at right angles to each other having (a) same frequencies and (b) different frequencies in the ratio 1:2. Lissajous figures and their uses. Oscillations of two masses connected by a spring.

Damped and forced oscillations: Damped SHM, energy of damped SHM, Q-value of damped oscillations, forced vibrations with one degree of freedom, transient and steady state oscillations, power in forced vibrations, sharpness of resonance and quality factor.

Waves: Representation of plane progressive wave, classical wave equation of a plane progressive wave and its general solution. Representation of spherical waves. Energy and energy density of plane progressive waves.

Waves in continuous media: Speed of transverse waves on a uniform string, interference of sound waves. Group velocity and phase velocity.

UNIT V (20 Lectures)

Ultrasonics: Properties, production, detection and applications of ultrasonic waves. Principle of ultrasonography.

Sound: Intensity and loudness of sound, bel and decibel, intensity levels, limit of human audibility.

Acoustics of buildings: Requirements of good auditorium, reverberation, reverberation time, absorption coefficient, Sabine's formula for reverberation time, live and dead room.

Text Books:

1. **A Treatise on General Properties of Matter**: Chatterjee and Sengupta, New Central Book Agency, Kolkata, 2008
2. **Mechanics**: JC Upadyaya, Ram Prasad and Sons, Agra, 1999
3. **Principle of Accoustics**: B. Ghosh, Shreedhar Publisher, Kolkata, 2004

Reference Books

1. **Undergraduate Physics Vol-I**: AB Bhattacharya and R Bhattacharya, New Central Book Agency, Kolkata, Reprint, 2013.
2. **College Physics Vol-I**, AB Gupta, Book and Allied (P) Ltd., Kolkata, Revised Reprint, 2005.
3. **Physics for Degree Students**: C.L Arora and Dr. P.S Hemne, S Chand, New Delhi, 2012.
4. **Mechanics**, DS Mathur, S Chand, New Delhi, 2012.
5. **Acoustics, Waves and Oscillations**: S.N Sen, New Age International, 2002.
6. **Waves and Oscillation:** RN Choudhuri, New Age International, 2010.