

## **B.Sc. (Semester-I)**

### **Syllabus for the examinations to be held in Dec. 2016, 2017, 2018**

**Subject: Physics (Theory)**

**Course Code/No.: UPHTC101**

**Title of the Course: Mechanics, Oscillations & Relativity Total Marks-100**

**No. of Credits: 04**

**Internal Assessment Test: 20 marks**

**Duration: 3 hours**

**End Semester University Examination: 80 marks (External)**

*The question paper shall be of 80 marks. There shall be 10 questions in the paper with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.*

#### **UNIT –I: Mechanics- I**

Unit vectors, displacement, area element, volume element, velocity and acceleration in plane polar, Cartesian, Spherical polar and cylindrical coordinate system.

Inertial and non inertial frames of references, uniformly rotating frame; Coriolis force and Centrifugal force, effect of centrifugal force due to rotation of the earth and coriolis force acting on a freely falling body, Geographical effects of coriolis force (qualitative)

#### **UNIT-II: Mechanics –II**

Two body system; laboratory and centre of mass system, relationship between displacements, velocities, kinetic energies and angles in lab and centre of mass system.

Inverse square law of force: Concept of central and non- central forces, equivalent one body problem. Angular momentum conservation in a central force field, Energy of reduced mass & its conservation, differential equation of orbit in a central force field, Turning points of motion, relation between eccentricity and energy, Kepler's laws & Satellite motion (Satellite Launching, Orbital speed, Escape Speed, altitude motion and time period).

#### **UNIT-III: Oscillation -I**

Differential equation and its solution, energy of simple harmonic oscillator, examples: Compound pendulum, Torsional pendulum, bifilar oscillations, Helmholtz resonator, LC circuit, Oscillation of two masses connected by a spring.

Nature of damping force, Damped simple harmonic oscillator, Differential equation and its solution, energy power dissipation, logarithmic decrement, relaxation time, quality factor, resistance and electromagnetic damping. Example of damping in physical systems, resistance damping, oscillatory discharge of a capacitor through circuit containing resistance and inductance, Electromagnetic damping in a moving coil galvanometer.

#### **UNIT-IV: Oscillation –II**

Driven harmonic oscillator, transient and steady state behaviour , solution of differential equation, velocity of the mechanical forced oscillator in the steady state, behaviour of displacement with driving force frequency , behaviour of velocity versus driving force frequency, power absorption and power dissipation, Sharpness of resonance, Quality factor, Electrical resonance.

### **UNIT-V: Theory of Relativity**

Galilean transformations and conservation laws: conservation of momentum and energy. Search for ether and Michelson-Morley experiment.

Postulates of special theory of relativity, Lorentz transformations, Consequences of Lorentz transformations, Length contraction, time dilation, experimental evidence in support of time dilation, twin paradox, simultaneity of events, velocity theorem, variation of mass with velocity, mass energy equivalence, energy-momentum relation, Illustrative examples in support of mass-energy equivalence, transformation relations between momentum and energy, particle with a zero rest mass, Doppler effect.

### **Scheme for Internal Assessment Test**

Upto 50% (after 45days) completion of the syllabus there shall be an internal assessment test of 20 Marks. It will carry two long answer type questions of 10 marks each and 8 short answer type questions out of which atleast two should be numerical problems. The students shall be asked to attempt one long answer and five short answer type questions.

### **Note for examiners/paper setters**

There will be two questions from each unit. The students have to attempt one question. Each question comprise part A (Short answer type questions of 04 marks each) and B (Long answer type question of 12 marks each). Part A can be short answer type/numerical and part B would be long answer type. There should be atleast two numerical in part-A of the question paper.

### **Text & Reference Books**

1. Mechanics by Hans and Puri.
2. Mechanics by Sikri.
3. Mechanics by D.S. Mathur
4. Classical Mechanics by Kumar and Gupta.
5. Classical Mechanics by Goldstien.
6. Waves and Vibrations by S.P. Puri.
7. Waves and oscillation by Brij Lal and Subramanum.
8. Waves and oscillation by A.P. French.
9. Waves and oscillation by S.L. Kakani.
10. Theory of Relativity by R. Resnick.
11. Theory of Relativity by French.
12. Theory of Relativity by Patharia.

## B.Sc. (Semester-I)

### Syllabus for the examinations to be held in Dec. 2016, 2017, 2018

**Subject: Physics (Practical)**

**Course Code/No.: UPHPC102**

**No. of Credits: 04**

**Internal Assessment: 50 marks**

**Final Practical Examination: 50 Marks**

**Total Marks-100**

#### List of the Practicals

1. To find the value of 'g' by bar pendulum.
2. To find the surface tension of water by Jaeger's Method.
3. To find Moment of Inertia of Fly-Wheel.
4. To find the Young Modulus by bending beam Method.
5. To find the frequency of AC supply by Electrical Vibrator.
6. To find the variation of magnetic field with distance.
7. To find low resistance by Carey Foster Bridge without calibrating.

#### Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by G L Squires Cambridge University Press
3. Advanced Practical Physics for Students by Worsnop and Flint
4. Practical Physics by R K Shukla
5. B.Sc Practical Physics by Harnam Singh

**Note: The candidates are required to complete at least 5 practicals.**

#### **Instructions for Internal/External Assessment**

Internal Assessment:-

Total Marks=50

- i. Attendance (20% weightage)=10Marks
- ii. Internal Test and day to day performance(60% weightage)=10(test)+20=30Marks
- iii. Viva Voice(20% weightage)=10Marks

a) External Practical Examination

- i. External Practical Paper=40Marks

ii. Viva-Voce=10Mark

## **B.Sc. (Semester-II)**

### **Syllabus for the examinations to be held in May 2017, 2018, 2019**

**Subject: Physics (Theory)**

**Course Code/No.: UPHTC201**

**Title of the Course: Vector Calculus, Electrostatics and Electromagnetic Waves**

**No. of Credits: 04**

**Internal Assessment Test: 20 marks**

**Duration: 3 hours**

**End Semester University Examination: 80 marks (External)**

**Total Marks-100**

*The question paper shall be of 80 marks. There shall be 10 questions in the paper with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.*

### **Unit-I**

#### **VECTOR CALCULUS**

Review of vector algebra, Scalar and vector fields, Gradient of a scalar field and its physical interpretation, Line, surface and volume integrals, Divergence of a vector field and its physical significance, Solenoidal field with examples, Gauss's divergence theorem.

Curl of a vector field and its physical significance, Stokes' theorem, Irrotational vector field, Vector identities.

### **Unit- II**

#### **ELECTROSTATICS**

Gauss's law in integral and differential forms, Line integral of electrostatic field, Conservative nature of electrostatic field, Electric field as the negative gradient of potential, Poisson's and Laplace's equations.

Electric quadrupole, Electric field and potential due to quadrupole, Energy of electrostatic field.

Dielectrics, Polar and non-polar molecules, Polarisation of dielectric, Polarisation vector  $\vec{P}$ , Displacement vector  $\vec{D}$ , Relation  $\vec{D} = \epsilon_0 \vec{E} + \vec{P}$ , Atomic polarizability, Electric

susceptibility, Relation  $K = 1 + \chi_e$ , Gauss's law in a dielectric medium (differential and

integral forms), Energy in the dielectric system, boundary conditions satisfied by  $\vec{E}$  and  $\vec{D}$  at the interface between two homogeneous dielectrics.

### Unit-III

#### ELECTRIC CURRENT AND MAGNETOSTATICS

Current and current density, Equation of continuity, Electrical conductivity, Microscopic form of Ohm's law, Failure of Ohm's law

Biot Savart's law, Ampere's circuit law ( integral and differential forms) and its limitations, Modified form of Ampere's Circuit Law, Displacement current, Divergence of magnetic field, Magnetic scalar and vector potentials, Divergence of vector potential, Derivation of Biot-Savart's law from vector potential.

Current loop as a magnetic dipole, Relation between magnetic dipole moment and angular momentum, magnetization vector  $\vec{M}$ , Magnetisation current, Free and bound currents,

Relation between  $\vec{B}$ ,  $\vec{H}$  and  $\vec{M}$ , Magnetic susceptibility and permeability, Boundary conditions satisfied by  $\vec{B}$  and  $\vec{H}$  at the interface between two media

### UNIT- IV

#### TIME VARYING FIELDS

Integral and differential forms of Faraday's laws of electromagnetic induction, Self inductance of a solenoid, Mutual inductance of two solenoids, Self inductance and mutual inductance of current loops, Reciprocity theorem of mutual inductance, Relation between self and mutual inductances, Coefficient of coupling.

Energy stored in a magnetic field, Maxwell's equations (differential and integral forms) and their interpretation, Poynting vector, Poynting theorem and its differential form.

### UNIT-V

#### ELECTROMAGNETIC WAVES

Electromagnetic waves in vacuum: The wave equations for  $\vec{E}$  and  $\vec{B}$ , Monochromatic plane electromagnetic waves and their transverse nature, Characteristic impedance.

Electromagnetic waves in dielectric medium: Propagation in linear media, Reflection and transmission at normal and oblique incidence, Derivation of laws of reflection and refraction.

Electromagnetic waves in conductors: Modified wave equations, Skin Depth, and Characteristic impedance.

### **Scheme for Internal Assessment Test**

Upto 50% (after 45days) completion of the syllabus there shall be an internal assessment test of 20 Marks. It will carry two long answer type questions of 10 marks each and 8 short answer type questions out of which atleast two should be numerical problems. The students shall be asked to attempt one long answer and five short answer type questions.

### **Note for examiners/paper setters**

There will be two questions from each unit. The students have to attempt one question. Each question comprise part A (Short answer type questions of 04 marks each) and B (Long answer type question of 12 marks each). Part A can be short answer type/numerical and part B would be long answer type. There should be atleast two numerical in part-A of the question paper.

### **Text and Reference Books:**

1. Vectors by Speigal
2. Electromagnetics by B.B. Laud
3. Electricity and Magnetism by K.K. Tiwari
4. Electricity, Magnetism and E. M. waves by K.K. Sharma
5. Introduction to Electrodynamics by David J. Griffiths
6. Electricity and Magnetism by A. E. Kip
7. Electricity and Magnetism by D. C. Tayal
8. Electricity and Magnetism by Reitz and Millford
9. Electricity and Magnetism by AK. Sikri

## **B.Sc. (Semester-II)**

### **Syllabus for the examinations to be held in May 2017, 2018, 2019**

**Subject: Physics (Practical)**

**Course Code/No.: UPHPC202**

**No. of Credits: 04**

**Internal Assessment: 50 marks**

**Final Practical Examination: 50 Marks**

**Total Marks-100**

#### **List of the Practical's**

1. To find Capacity of a Capacitor by Electrical vibrator.
2. To find the Impedance of series LCR circuit.
3. To find low resistance by Carey Foster Bridge (Calibrating Bridgewire).
4. Compare the capacitance by De-Surety's Method.
5. Find Horizontal component of Earth's magnetic field by using vibration and deflection magnetometer.
6. To find the rigidity of wire by Maxwell's needle.
7. Bifilar Pendulum.
8. To find the frequency by Sonometer.

#### **Reference Books**

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by G L Squires Cambridge University Press
3. Advanced Practical Physics for Students by Worsnop and Flint
4. Practical Physics by R K Shukla
5. B.Sc Practical Physics by Harnam Singh

**Note: The candidates are required to complete at least 5 practicals.**

#### **Instructions for Internal/External Assessment**

a) Internal Assessment:-

Total Marks=50

- iv. Attendance (20% weightage)=10Marks
- v. Internal Test and day to day performance(60% weightage)=10(test)+20=30Marks
- vi. Viva Voice(20% weightage)=10Marks

b) External Practical Examination

- iii. External Practical Paper=40Marks
- iv. Viva-Voce=10Mark