"Dissemination of Education for Knowledge, Science and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur (Autonomous)

DEPARTMENT OF PHYSICS

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

Curriculum, Teaching and Evaluation Structure

for

B.Sc.-I Physics

Semester – I & II

(Implemented from academic year 2023-24 onwards)

B. Sc. Part – I Semester -I PHYSICS
DSC-I: DSC03PHY11: MECHANICS -I
Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -

CO_1: Demonstrate and understand the basic primary knowledge of Mechanics theories in Physics.

CO_2: Demonstrate a proficiency in solving problems in Vectors, Ordinary Differential Equations etc.

CO_3:Understand the basic concepts of dot product, cross product, Ordinary Differential Equations, laws of motion, rotational motion, momentum and energy etc.

CO_4: Develop the critical skill in students to understand mechanics.

Section-I: Mechanics I

Unit	Syllabus	Lectures
Unit 1	**Vectors:** Vector algebra: Definition of vector, polar vectors and axial vectors, addition of vectors, rectangular resolution of vectors, unit vector (def), position vector of a point, product of two vector, scalar and vector products-scalar or dot products and its geometrical interpretation, work done as a scalar product, Vector or cross product and their useful results, area of parallelogram, Scalar triple product, Vector triple product and its geometrical interpretation, problems.	6
Unit 2	**Ordinary Differential Equations:** Introduction to differential equation, Ordinary and Partial differential Equations, 1st order homogeneous differential equations, 2nd order homogeneous differential equations with constants coefficients, examples	4
Unit 3	**Momentum and Energy:** Introduction to mechanics, Mechanics of a particle - Conservation theorem of linear momentum, angular momentum, energy, Concept of Centre of Mass, Mechanics of system of particles - Conservation theorem of linear momentum, angular momentum, energy.	5
Unit 4	**1. Laws of motion:** Introduction of coordinate systems (Cartesian, Polar, Cylindrical, and Spherical), Definition of translational and rotational motion, force and torque, Frames of reference - Inertial and Non-inertial frame with examples, Newton's laws of motion (first, second and third) and their proofs. **2. Rotational motion:** Rotational variables - Angular position, Angular displacement, Angular velocity, Angular acceleration, Torque, Moment of inertia – definition, M.I. of a spherical shell about its axis of symmetry, M.I. of solid cylinder about it symmetry axis, Motion of spherical shell and solid cylinder rolling down an inclined plane.	15

B. Sc. Part – I Semester -I Physics
DSC-II: DSC03PHY12: Mechanics II
Theory: 30 hrs.
Marks-50 (Credits: 02)
Course II: Mechanics – II

Course Outcomes: After the completion of the course the student will be able to -
CO_1: demonstrate and understand the basic primary knowledge of Mechanics theories in Physics.
CO_2: get a proficiency in solving problems in Elasticity, gravitation, oscillation, Differential equation of Simple harmonic motion, special theory of relativity etc.
CO_3:understand the basic concepts of elastic constants, gravitation and Kepler's laws, Simple harmonic motion, etc.
CO_4: develop the critical skill in students to understand special theory of relativity.

Mechanics – II

Unit	Syllabus	Lectures
Unit 1	**1. Gravitation:** Newton's Law of Gravitation, Motion of a particle in a central force field (motion in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statement only), Satellite in circular orbit and applications, Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS). **2. Oscillations:** Simple harmonic motion (SHM), Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Damped oscillations, Forced oscillations.	15
Unit 2	**1. Elasticity**: Bending of beam, Bending moment, Cantilever (without considering weight of cantilever), Beam supported at both the ends (without considering weight of beam). Torsional oscillation, Work done in twisting a wire, Twisting couple on a cylinder, Torsional pendulum - Determination of Rigidity modulus and moment of inertia, Determination of Y, η and σ by Searles method. **2. Surface Tension**: Surface Tension, Angle of contact and wettability, relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension by Jaeger's method, Factors affecting surface tension, Applications of surface tension.	15

Reference Books:

1. University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison-Wesley
2. Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley eastern Ltd, New Delhi.
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford UniversityPress
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. Physics – S.G. Starling and Woodal Longmams and Green Co. Ltd.
7. Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi.
8. A text Book of properties of matter–N.S. Khare and S. Kumar. Atmaram and sons New Delhi.
9. Concepts of Physics –Vol.1 H.C. Verma -Bharati Bhavan Publishers.

B. Sc. Part – I Semester -II Physics

DSC-III: DSC03PHY21: Electricity and Magnetism - I

Theory: 30 hrs.

Course III: ELECTRICITY AND MAGNETISM – I

Course Outcomes: After the completion of the course the student will be able to -

CO_1: demonstrate and understand the basic primary knowledge of Electricity, Magnetism and Electromagnetic Theory.

CO_2: demonstrate a proficiency in solving problems in Thevenin's theorem, and Norton's theorem, magnetism, electrostatics etc.

CO_3:understand the basic concepts of Ballistic galvanometer, networks theorem, magnetostatics and electrostatics etc.

CO_4: develop the critical skill in students to understand electricity and magnetism.

Section-I: Electricity, Magnetism and Electromagnetic Theory I

Unit	Syllabus	Lectures
Unit 1	**1. Electricity:** Introduction – DC and varying currents, LR Circuit, RC circuit and LC circuit, Growth and decay of currents, Theory of B.G. and constants of B.G., time constants τ **2. A.C. Circuits:** Complex numbers and their application in solving a. c. series LCR circuit, complex impedance, Reactance, Admittance, and Susceptance, Resonance in LCR series circuit, Sharpness of resonance (qualitative treatment only), Q-factor (definition only) A.C. Bridge - Owen's Bridge **3. Network Theorems:** Introduction, Node, Junction, Branch, Loop, Active and passive elements, Thevenin's theorem, Nortan's theorem and equivalence between them, problems.	15
Unit 3	**1. Magnetism**: Introduction to magnetization and intensity of Magnetization, Biot-Savart's law & its applications - straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential.	15

	Ampere's circuital law **2. Magnetic Materials and their Properties:** Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Hysteresis and hysteresis curve, diamagnetic, paramagnetic, ferromagnetic, ferrimagnetic and anti-ferromagnetic materials.	

B. Sc. Part – I Semester -II Physics

DSC-IV: DSC03PHY22: Electricity and Magnetism - II

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course IV: ELECTRICITY AND MAGNETISM – II

Course Outcomes: After the completion of the course the student will be able to -

CO_1: demonstrate and understand the applied knowledge of electricity, Magnetism and Electromagnetic Theory.

CO_2: demonstrate a proficiency in solving problems in gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Maxwell's equations and Electromagnetic wave propagation.

CO_3: understand the basic concepts of gradient, divergence, Curl and their significance, Gauss-divergence theorem and Stoke's theorem of vectors, Electromagnetic Induction, Maxwell's equations and Electromagnetic wave propagation etc.

CO4: develop the critical skill in students to understand applied knowledge of Electricity, Magnetism and Electromagnetic Theory.

ELECTRICITY AND MAGNETISM – II

Unit	Syllabus	Lectures
Unit 1	**1.** Vector Differential: Introduction, Del operator, gradient of scalar field and its physical significance, divergence of vector field and its physical significance, curl of vector field **2.** Vector Integral: Line integral, surface integral, volume integral (definitions only), Gauss divergence theorem (statements and proof), Statements of Stoke's theorem, Greens symmetrical theorem.	15
Unit 2	**1. Electrostatics**: Electrostatic field, electric flux, Gauss's theorem of electrostatics, electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential, capacitance of an isolated spherical conductor, parallel plate, spherical and cylindrical condenser, energy per unit volume in electrostatic field. **2. Dielectrics**: Dielectric medium, polarization vector, displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric.	15

Reference Books:

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
2. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
5. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
6. Electricity and Magnetism – Khare and Shrivastav.
7. Foundations of Electromagnetic Theory – Rritz and Milford.
8. University Physics 9th edition – Young and Freedman.
9. Concepts of Physics Vol-2 H. C. Verma

DSC- PR-I: DSC03PHY29: DSC Physics LAB-1
Practical: Four lectures of 60 minutes per week per batch
Marks: 50 (Credits 02)

PHYSICS LAB (I)
Semester I : MECHANICS
30 Hours - Credits – 02

1. Measurements of length (or diameter) using Vernier calliper, screw gauge, spherometer andtravelling microscope.
2. To determine the Moment of Inertia of a Flywheel.
3. To determine the Moment of inertia of a disc using auxiliary annular ring.
4. Young's modulus of material of Bar by vibration.
5. Modulus of rigidity of material of wire by torsional oscillations.
6. Y/η of Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. Poisson ratio for rubber using rubber tube.
10. Surface tension of water by capillary method.

PHYSICS LAB (II)
Semester: II
Semester: II, ELECTRICITY and MAGNETISM
30 Hours - Credits - 02

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c), Checking electrical fuses and Continuity.
2. To determine constants of B. G.
3. To compare capacitances using De'Sauty's bridge.
4. To determine impedance of series LCR circuit.

5. To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.
6. Frequency of A. C. mains by sonometer.
7. To verify the Thevenin theorem.
8. To verify the Norton theorem.
9. Determination of low resistance using Carey foster's Bridge.
10. Verification of Kirchoff's voltage and current law

Reference Books

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, AsiaPublishing House.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition,2011, Kitab Mahal, New Delhi.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publishers
- College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).
- Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)
- Advanced Level Practical Physics – J.M. Nelcon, J.M. Ogloom (EIBS).
- A Text Book of Practical Physics - Shrinivasan and Balasubramanyam.
- Engineering Practical Physics- S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt.Ltd.

B. Sc. Part – I Semester -I PHYSICS

MIN-I: MIN03PHY11: Mechanics I

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -

CO_1: Demonstrate and understand the basic primary knowledge of Mechanics theories in Physics.

CO_2: Demonstrate a proficiency in solving problems in Vectors, Ordinary Differential Equations etc.

CO_3:Understand the basic concepts of dot product, cross product, Ordinary Differential Equations, laws of motion, rotational motion, momentum and energy etc.

CO_4: Develop the critical skill in students to understand mechanics.

Section-I: Mechanics I

Unit	Syllabus	Lectures
Unit 1	**Vectors:** Vector algebra: Definition of vector, polar vectors and axial vectors, addition of vectors, rectangular resolution of vectors, unit vector (def), position vector of a point, product of two vector, scalar and vector products-scalar or dot products and its geometrical interpretation, work done as a scalar product, Vector or cross product and their useful results, area of parallelogram, Scalar triple product, Vector triple product and its geometrical interpretation, problems.	6
Unit 2	**Ordinary Differential Equations:** Introduction to differential equation, Ordinary and Partial differential Equations, 1st order homogeneous differential equations, 2nd order homogeneous differential equations with constants coefficients, examples	4
Unit 3	**Momentum and Energy:** Introduction to mechanics, Mechanics of a particle - Conservation theorem of linear momentum, angular momentum, energy, Concept of Centre of Mass, Mechanics of system of particles - Conservation theorem of linear momentum, angular momentum, energy.	5
Unit 4	**3. Laws of motion:** Introduction of coordinate systems (Cartesian, Polar, Cylindrical, and Spherical), Definition of translational and rotational motion, force and torque, Frames of reference - Inertial and Non-inertial frame with examples, Newton's laws of motion (first, second and third) and their proofs. **4. Rotational motion:** Rotational variables - Angular position, Angular displacement, Angular velocity, Angular acceleration, Torque, Moment of inertia – definition, M.I. of a spherical shell about its axis of symmetry, M.I. of solid cylinder about it symmetry axis, Motion of spherical shell and solid cylinder rolling down an inclined plane.	15

B. Sc. Part – I Semester -I Physics
MIN -II: MIN03PHY12: Mechanics II
Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -
CO_1: demonstrate and understand the basic primary knowledge of Mechanics theories in Physics.
CO_2 get a proficiency in solving problems in Elasticity, gravitation, oscillation, Differential equation of Simple harmonic motion, special theory of relativity etc.
CO_3: understand the basic concepts of elastic constants, gravitation and Kepler's laws, Simple harmonic motion, etc.
CO_4: develop the critical skill in students to understand special theory of relativity.

Mechanics – II

Unit	Syllabus	Lectures
Unit 1	**3. Gravitation:** Newton's Law of Gravitation, Motion of a particle in a central force field (motion in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statement only), Satellite in circular orbit and applications, Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS). **4. Oscillations:** Simple harmonic motion (SHM), Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Damped oscillations, Forced oscillations.	15
Unit 2	**3. Elasticity**: Bending of beam, Bending moment, Cantilever (without considering weight of cantilever), Beam supported at both the ends (without considering weight of beam). Torsional oscillation, Work done in twisting a wire, Twisting couple on a cylinder, Torsional pendulum - Determination of Rigidity modulus and moment of inertia, Determination of Y, η and σ by Searles method. **4. Surface Tension**: Surface Tension, Angle of contact and wettability, relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension by Jaeger's method, Factors affecting surface tension, Applications of surface tension.	15

Reference Books:

10. University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison-Wesley
11. Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
12. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley eastern Ltd, New Delhi.
13. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford UniversityPress
14. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
15. Physics – S.G. Starling and Woodal Longmams and Green Co. Ltd.
16. Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi.
17. A text Book of properties of matter–N.S. Khare and S. Kumar. Atmaram and sons New Delhi.
18. Concepts of Physics –Vol.1 H.C. Verma -Bharati Bhavan Publishers.

B. Sc. Part – I Semester -II Physics
MIN -III: MIN03PHY21: Electricity and Magnetism - I
Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -

CO_1: demonstrate and understand the basic primary knowledge of Electricity, Magnetism and Electromagnetic Theory.

CO_2: demonstrate a proficiency in solving problems in Thevenin's theorem, and Norton's theorem, magnetism, electrostatics etc.

CO_3:understand the basic concepts of Ballistic galvanometer, networks theorem, magnetostatics and electrostatics etc.

CO_4: develop the critical skill in students to understand electricity and magnetism.

Section-I: Electricity, Magnetism and Electromagnetic Theory I

Unit	Syllabus	Lectures
Unit 1	**4. Electricity:** Introduction – DC and varying currents, LR Circuit, RC circuit and LC circuit, Growth and decay of currents, Theory of B.G. and constants of B.G., time constants T **5. A.C. Circuits:** Complex numbers and their application in solving a. c. series LCR circuit, complex impedance, Reactance, Admittance, and Susceptance, Resonance in LCR series circuit, Sharpness of resonance (qualitative treatment only), Q-factor (definition only) A.C. Bridge - Owen's Bridge **6. Network Theorems:** Introduction, Node, Junction, Branch, Loop, Active and passive elements, Thevenin's theorem, Nortan's theorem and equivalence between them, problems.	15
Unit 3	**3. Magnetism**: Introduction to magnetization and intensity of Magnetization, Biot-Savart's law & its applications - straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law	15

	Ampere's circuital law **4. Magnetic Materials and their Properties:** Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Hysteresis and hysteresis curve, diamagnetic, paramagnetic, ferromagnetic, ferrimagnetic and anti-ferromagnetic materials.	

B. Sc. Part – I Semester -II PHYSICS

MIN -IV: MIN03PHY22: Electricity and Magnetism - II

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -

CO_1: demonstrate and understand the applied knowledge of electricity, Magnetism and Electromagnetic Theory.

CO_2: demonstrate a proficiency in solving problems in gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Maxwell's equations and Electromagnetic wave propagation.

CO_3: understand the basic concepts of gradient, divergence, Curl and their significance, Gauss-divergence theorem and Stoke's theorem of vectors, Electromagnetic Induction, Maxwell's equations and Electromagnetic wave propagation etc.

CO4: develop the critical skill in students to understand applied knowledge of Electricity, Magnetism and Electromagnetic Theory.

ELECTRICITY AND MAGNETISM – II

Unit	Syllabus	Lectures
Unit 1	**3.** Vector Differential: Introduction, Del operator, gradient of scalar field and its physical significance, divergence of vector field and its physical significance, curl of vector field **4.** Vector Integral: Line integral, surface integral, volume integral (definitions only), Gauss divergence theorem (statements and proof), Statements of Stoke's theorem, Greens symmetrical theorem.	15
Unit 2	**3. Electrostatics**: Electrostatic field, electric flux, Gauss's theorem of electrostatics, electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential, capacitance of an isolated spherical conductor, parallel plate, spherical and cylindrical condenser, energy per unit volume in electrostatic field. **4. Dielectrics**: Dielectric medium, polarization vector, displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric.	15

Reference Books:

11. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
12. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
13. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
14. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
15. Electricity and Magnetism – Khare and Shrivastav.
16. Foundations of Electromagnetic Theory – Rritz and Milford.
17. University Physics 9th edition – Young and Freedman.
18. Concepts of Physics Vol-2 H. C. Verma

MIN-PR-I: MIN03PHY29: MIN PHYSICS LAB-1
Practical: Four lectures of 60 minutes per week per batch
Marks: 50 (Credits 02)
PHYSICS LAB (I)
Semester: I MECHANICS
30 Hours - Credits – 02

11. Measurements of length (or diameter) using Vernier calliper, screw gauge, spherometer andtravelling microscope.
12. To determine the Moment of Inertia of a Flywheel.
13. To determine the Moment of inertia of a disc using auxiliary annular ring.
14. Young's modulus of material of Bar by vibration.
15. Modulus of rigidity of material of wire by torsional oscillations.
16. Y/η of Wire by Searle's method.
17. To determine g by Bar Pendulum.
18. To determine g by Kater's Pendulum.
19. Poisson ratio for rubber using rubber tube.
20. Surface tension of water by capillary method.

PHYSICS LAB (II)
Semester: II
Semester: II, ELECTRICITY and MAGNETISM
30 Hours - Credits - 02

11. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c), Checking electrical fuses and Continuity.
12. To determine constants of B. G.
13. To compare capacitances using De'Sauty's bridge.
14. To determine impedance of series LCR circuit.
15. To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.
16. Frequency of A. C. mains by sonometer.

17. To verify the Thevenin theorem.
18. To verify the Norton theorem.
19. Determination of low resistance using Carey foster's Bridge.
20. Verification of Kirchoff's voltage and current law

Reference Books

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, AsiaPublishing House.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition,2011, Kitab Mahal, New Delhi.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publishers
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- Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)
- Advanced Level Practical Physics – J.M. Nelcon, J.M. Ogloom (EIBS).
- A Text Book of Practical Physics - Shrinivasan and Balasubramanyam.
- Engineering Practical Physics- S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt.Ltd.

B. Sc. Part – I Semester -I Physics
OEC-I: OEC03PHY11: MECHANICS -I
Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -
CO_1: Demonstrate and understand the basic primary knowledge of Mechanics theories in Physics.
CO_2: Demonstrate a proficiency in solving problems in Vectors, Ordinary Differential Equations etc.
CO_3:Understand the basic concepts of dot product, cross product, Ordinary Differential Equations, laws of motion, rotational motion, momentum and energy etc.
CO_4: Develop the critical skill in students to understand mechanics.

Section-I: Mechanics I

Unit	Syllabus	Lectures
Unit 1	**Vectors:** Vector algebra: Definition of vector, polar vectors and axial vectors, addition of vectors, rectangular resolution of vectors, unit vector (def), position vector of a point, product of two vector, scalar and vector products-scalar or dot products and its geometrical interpretation, work done as a scalar product, Vector or cross product and their useful results, area of parallelogram, Scalar triple product, Vector triple product and its geometrical interpretation, problems.	6
Unit 2	**Ordinary Differential Equations:** Introduction to differential equation, Ordinary and Partial differential Equations, 1st order homogeneous differential equations, 2nd order homogeneous differential equations with constants coefficients, examples	4
Unit 3	**Momentum and Energy:** Introduction to mechanics, Mechanics of a particle - Conservation theorem of linear momentum, angular momentum, energy, Concept of Centre of Mass, Mechanics of system of particles - Conservation theorem of linear momentum, angular momentum, energy.	5
Unit 4	**5. Laws of motion:** Introduction of coordinate systems (Cartesian, Polar, Cylindrical, and Spherical), Definition of translational and rotational motion, force and torque, Frames of reference - Inertial and Non-inertial frame with examples, Newton's laws of motion (first, second and third) and their proofs. **6. Rotational motion:** Rotational variables - Angular position, Angular displacement, Angular velocity, Angular acceleration, Torque, Moment of inertia – definition, M.I. of a spherical shell about its axis of symmetry, M.I. of solid cylinder about it symmetry axis, Motion of spherical shell and solid cylinder rolling down an inclined plane.	15

B. Sc. Part – I Semester -I PHYSICS
OEC -II: OEC03PHY12: Mechanics II
Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -
CO_1: To demonstrate and understand the basic primary knowledge of Mechanics theories in Physics
CO_2: Students will demonstrate a proficiency in solving problems in Elasticity, gravitation, oscillation, Differential equation of Simple harmonic motion, special theory of relativity etc.
CO_3:To understand the basic concepts of elastic constants, gravitation and Kepler's laws, Simple harmonic motion, etc.
CO_4: To develop the critical skill in students to understand special theory of relativity.

Mechanics – II

Unit	Syllabus	Lectures
Unit 1	**5. Gravitation:** Newton's Law of Gravitation, Motion of a particle in a central force field (motion in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statement only), Satellite in circular orbit and applications, Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS). **6. Oscillations:** Simple harmonic motion (SHM), Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Damped oscillations, Forced oscillations.	15
Unit 2	**5. Elasticity**: Bending of beam, Bending moment, Cantilever (without considering weight of cantilever), Beam supported at both the ends (without considering weight of beam). Torsional oscillation, Work done in twisting a wire, Twisting couple on a cylinder, Torsional pendulum - Determination of Rigidity modulus and moment of inertia, Determination of Y, η and σ by Searles method. **6. Surface Tension**: Surface Tension, Angle of contact and wettability, relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension by Jaeger's method, Factors affecting surface tension, Applications of surface tension.	15

Reference Books:

19. University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison-Wesley
20. Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
21. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley eastern Ltd, New Delhi.
22. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford UniversityPress
23. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
24. Physics – S.G. Starling and Woodal Longmams and Green Co. Ltd.
25. Elements of properties of matter – D.S. Mathur, Shamlal Charitable trust New Delhi.
26. A text Book of properties of matter–N.S. Khare and S. Kumar. Atmaram and sons New Delhi.
27. Concepts of Physics –Vol.1 H.C. Verma -Bharati Bhavan Publishers.

B. Sc. Part – I Semester -II Physics

OEC-III: OEC03PHY21: Electricity and Magnetism - I

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -

CO_1: demonstrate and understand the basic primary knowledge of Electricity, Magnetism and Electromagnetic Theory.

CO_2: demonstrate a proficiency in solving problems in Thevenin's theorem, and Norton's theorem, magnetism, electrostatics etc.

CO_3:understand the basic concepts of Ballistic galvanometer, networks theorem, magnetostatics and electrostatics etc.

CO_4: develop the critical skill in students to understand electricity and magnetism.

Section-I: Electricity, Magnetism and Electromagnetic Theory I

Unit	Syllabus	Lectures
Unit 1	**7. Electricity:** Introduction – DC and varying currents, LR Circuit, RC circuit and LC circuit, Growth and decay of currents, Theory of B.G. and constants of B.G., time constants τ **8. A.C. Circuits:** Complex numbers and their application in solving a. c. series LCR circuit, complex impedance, Reactance, Admittance, and Susceptance, Resonance in LCR series circuit, Sharpness of resonance (qualitative treatment only), Q-factor (definition only) A.C. Bridge - Owen's Bridge **9. Network Theorems:** Introduction, Node, Junction, Branch, Loop, Active and passive elements, Thevenin's theorem, Nortan's theorem and equivalence between them, problems.	15
Unit 3	**5. Magnetism**: Introduction to magnetization and intensity of Magnetization, Biot-Savart's law & its applications - straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential,	15

	Ampere's circuital law **6. Magnetic Materials and their Properties:** Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Hysteresis and hysteresis curve, diamagnetic, paramagnetic, ferromagnetic, ferrimagnetic and anti-ferromagnetic materials.	

B. Sc. Part – I Semester -II Physics

OE -IV: OEC03PHY22 Electricity and Magnetism - II

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes: After the completion of the course the student will be able to -

CO_1: demonstrate and understand the applied knowledge of electricity, Magnetism and Electromagnetic Theory.

CO_2: demonstrate a proficiency in solving problems in gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Maxwell's equations and Electromagnetic wave propagation.

CO_3: understand the basic concepts of gradient, divergence, Curl and their significance, Gauss-divergence theorem and Stoke's theorem of vectors, Electromagnetic Induction, Maxwell's equations and Electromagnetic wave propagation etc.

CO4: To develop the critical skill in students to understand applied knowledge of Electricity, Magnetism and Electromagnetic Theory.

ELECTRICITY AND MAGNETISM – II

Unit	Syllabus	Lectures
Unit 1	**5.** Vector Differential: Introduction, Del operator, gradient of scalar field and its physical significance, divergence of vector field and its physical significance, curl of vector field **6.** Vector Integral: Line integral, surface integral, volume integral (definitions only), Gauss divergence theorem (statements and proof), Statements of Stoke's theorem, Greens symmetrical theorem.	15
Unit 2	**5. Electrostatics**: Electrostatic field, electric flux, Gauss's theorem of electrostatics, electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential, capacitance of an isolated spherical conductor, parallel plate, spherical and cylindrical condenser, energy per unit volume in electrostatic field. **6. Dielectrics**: Dielectric medium, polarization vector, displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric.	15

Reference Books:

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
2. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
5. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
6. Electricity and Magnetism – Khare and Shrivastav.
7. Foundations of Electromagnetic Theory – Rritz and Milford.
8. University Physics 9th edition – Young and Freedman.
9. Concepts of Physics Vol-2 H. C. Verma

10. OE-PR-I: OEL03PHY29: OEC Physics LAB-1
11.
12. Practical: Four lectures of 60 minutes per week per batch
13. Marks: 50 (Credits 02)
14.
15. PHYSICS LAB (I)
16. Semester: I MECHANICS
17. 30 Hours - Credits – 02

1. Measurements of length (or diameter) using Vernier calliper, screw gauge, spherometer andtravelling microscope.
2. To determine the Moment of Inertia of a Flywheel.
3. To determine the Moment of inertia of a disc using auxiliary annular ring.
4. Young's modulus of material of Bar by vibration.
5. Modulus of rigidity of material of wire by torsional oscillations.
6. Y/η of Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. Poisson ratio for rubber using rubber tube.
10. Surface tension of water by capillary method.

PHYSICS LAB (II)
Semester: II
Semester: II, ELECTRICITY and MAGNETISM
30 Hours - Credits - 02

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c), Checking electrical fuses and Continuity.
2. To determine constants of B. G.
3. To compare capacitances using De'Sauty's bridge.
4. To determine impedance of series LCR circuit.

5. To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.
6. Frequency of A. C. mains by sonometer.
7. To verify the Thevenin theorem.
8. To verify the Norton theorem.
9. Determination of low resistance using Carey foster's Bridge.
10. Verification of Kirchoff's voltage and current law

Reference Books

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, AsiaPublishing House.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition,2011, Kitab Mahal, New Delhi.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publishers
- College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).
- Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)
- Advanced Level Practical Physics – J.M. Nelcon, J.M. Ogloom (EIBS).
- A Text Book of Practical Physics - Shrinivasan and Balasubramanyam.
- Engineering Practical Physics- S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt.Ltd.

B. Sc. Part – I Semester-II Skill Enhancement Course
Theory: 30 Hours
Marks-50
B.Sc. I SEC Lab Work (Practical) I
(Credits: 01)

1) Measurement of least counts of various instruments
2) plotting of graphs and analysis
3) Study and calibration of spectrometer
4) Charging, discharging of capacitor
5) To find the focal length of a convex mirror, using a convex lens.
6) To determine the resistance per unit length of given wire
7) Estimation of errors
8) To determine the coefficient of viscosity of given viscous liquid
9) 9 To study the truth tables of logic gates.
10) To study of calibration of CRO

B.Sc. I SEC Lab Work (Practical) II
(Credits: 01)

1) PN junction diode characteristics
2) Half wave rectifier circuit
3) Bridge rectifier circuit
4) Transistor characteristics in CE mode
5) Transistor characteristics in CB mode
6) Transistor as voltage regulator
7) Kirchhoff's voltage law
8) Kirchhoff's current law
9) Determination of resistance by colour code method
10) Study of waveform of diode, capacitor and transistor using CRO.

Nature of Question Paper

Theory: Time - 2 hours, Marks-40
Instructions: All questions are compulsory.

Q.1 Select Correct Alternative **(08)**

1. .....
   A) B) C) D)
2. .....
   B) B) C) D)
3. .....
   C) B) C) D)
4. .....
   D) B) C) D)
5. .....
   E) B) C) D)
6. .....
   F) B) C) D)
7. .....
   G) B) C) D)
8. .....
   H) B) C) D)

Q.2 Attempt any two **(16)**

1.....
2.....
3.....
4.....
5.....
6.....

Q. 3 Attempt any four **(16)**

1.....
2.....
3.....
4.....
5.....
6.....