	Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.**		Year: **First**	Session: **2022-2023**
1	Course Code	**PHY – 1T**			
2	Course Title	**MECHANICS**			
3	Course Type	**Theory**			
4	Pre-requisite (if any)	No			
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to:** • Get knowledge about the vectors and differential equations used in physics. • Get an idea of different types of motions and conservation laws. • Get an idea about rotational motion and various properties of matter like elasticity and viscosity. • Understand various types of oscillatory motion and GPS system. • Get an idea about Frame of reference and special theory of relativity. • Solve numerical problems based on entire syllabus.				
6	**Credit Value**	**Theory : 4**			
7	**Total Marks**	**Max. Marks: 50**		**Min Passing Marks : 17**	

Part B: Content of the Course		
Total Periods: 60		
Unit	**Topic**	**Number of Periods**
I	**Vectors**: Vector algebra, Derivatives of a vector with respect to a parameter, Scalar and vector products of two, three and four vectors, Gradient, divergence and curl of vectors fields, Polar and Axial vectors. **Ordinary Differential Equations:** 1st order homogeneous differential equations, exact and non-exact differential equations, 2nd order homogeneous and nonhomogeneous differential equations with constant coefficients (Operator Method Only).	12
II	**Laws of Motion:** Review of Newton's Laws of motion. Dynamics of a system of particles, Concept of Centre of Mass, determination of center of mass for discrete and continuous systems having cylindrical and spherical symmetry. **Work and Energy:** Motion of rocket, Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of momentum	12

	and energy, Elastic and in-elastic Collisions.	
III	**Rotational Dynamics:** Angular velocity, Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (rod, disc, cylinder, solid sphere). **Elasticity:** Hooke's Law – Stress – strain diagram – Elastic moduli – Relation between elastic constants – Poisson's Ratio – Expression for Poisson's Ratio in terms of Elastic Constants – Work done in stretching and work done in twisting a wire – Twisting couple on a cylinder – Determination of Rigidity modules, Elementary idea of Surface tension and Viscosity, flow of fluids, coefficient of viscosity, Stoke's law, expression for terminal velocity, wetting.	12
IV	**Gravitation:** Newton's Law of Gravitation, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statements only), Satellite in circular orbit and applications, Geosynchronous orbits. **Oscillations:** Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).	12
V	**Special Theory of Relativity:** Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:
1. University Physics. FW Sears, MW Zemansky & HD Young 13/e, 1986. Addison Wesley
2. Mechanics Berkeley Physics course, v.1:Charles Kittel, et.al. 2007, Tata McGrawHill
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

Link for e-Books for Physics:
1. *All e-books of physics   https://www.e-booksdirectory.com/listing.php?category=2*
2. *Free physics text book in PDF*
   https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0

Part A: Introduction

Program: **Certificate Course**		Class: **B.Sc.**	Year: **First**	Session: **2022-2023**	
1	Course Code	**PHY – 2T**			
2	Course Title	**ELECTRICITY AND MAGNETISM**			
3	Course Type	**Theory**			
4	Pre-requisite (if any)	No			
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to –** • Get knowledge about the vectors analysis and able to apply in electrostatic and Magnetostatics. • Get idea about electric fields, force and potential. • Get idea about Dielectric and Electric currents and also the application in AC circuits. • Get idea about Magnetic properties of material. • To get idea about Electromagnetic Induction and Maxwell's equation and Electromagnetic wave propagation. • Solve numerical problems based on entire syllabus.			
6	**Credit Value**	**Theory : 4**			
7	**Total Marks**	**Max. Marks: 50**		**Min Passing Marks : 17**	

Part B: Content of the Course

Total Periods: 60

Unit	Topic	Number of Periods
I	**Vector Analysis**: Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics.	12
II	**Electrostatics:** Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. 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.	12

III	**Dielectric & Electric Currents:** Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric. Steady current, current density J, non – steady current an ontinuity equation, Kirchoff's law (statement only), Ideal constant – voltage and constant – current sources, Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and maximum power transfer theorem, Rise and decay of current in LR, CR, LCR circuits.	12
IV	**Magnetism:** Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.	12
V	**Electromagnetic Induction:** Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field. **Maxwell's equations and Electromagnetic wave propagation:** Equation of continuity of current, Displacement current, Maxwell's equations, Wave equation in free space.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. Vector analysis – Schaum's Outline, M.R. Spiegel, S. Lipschutz, D. Spellman, 2nd Edn., 2009, McGraw- Hill Education.
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
3. Electricity & Magnetism, J.H. Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press
4. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

Link for e-Books for Physics:

1. *All e-books of physics* *https://www.e-booksdirectory.com/listing.php?category=2*
2. *Free physics text book in PDF*
   https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0K ma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE

3. *Cambridge University Books for Physics https://www.cambridgeindia.org/*
4. *Books for solving physics problems https://bookboon.com/en/physics-ebooks*

Scheme of B. Sc. Physics

Year	Course Code	Subject Name	Theory/Practical	Total Credit	Total Marks	
					Max	Min
First year	PHY-1T	Mechanics	Theory	4	50	17
	PHY-2T	Electricity and Magnetism	Theory	4	50	17
	PHY-1P	LAB 1: Mechanics, Electricity and Magnetism	Practical	2	50	17
Second year	PHY-3T	Thermal Physics and Statistical Mechanics	Theory	4	50	17
	PHY-4T	Waves and Optics	Theory	4	50	17
	PHY-2P	LAB 2: Thermal Physics, Statistical Mechanics, Waves and Optics	Practical	2	50	17
Third year	PHY-5T	Digital and Analog Circuits and Instruments	Theory	4	50	17
	PHY-6T	Elements of Modern Physics	Theory	4	50	17
	PHY-3P	LAB 3: Digital and Analog Circuits and Instruments, Modern Physics	Practical	2	50	17
				5	50	17

Note: There shall be four extra credits in all the years of under graduation for internship/apprenticeship. The certificate of extra credits would be provided by the university concern.

Part A: Introduction

	Program: **Certificate Course**	Class: **B.Sc.**	Year: **First**	Session: **2022-2023**
1	Course Code		PHY 1P	
2	Course Title		LAB 1: Mechanics, Electricity and Magnetism	
3	Course Type		Practical	
4	Pre-requisite (if any)		NO	
5	Course Learning Outcomes (CLO)	**Expected Outcomes:** • To get knowledge about the use of various measuring instruments. • To get understanding about the simple harmonic motion, elasticity, surface tension and viscosity. • Students will be able to understand applications of basic principle of Electricity and Magnetism theory in real world.		
6	Credit Value		Practical : 2	
7	Total Marks	Max. Marks: 50		Min Passing Marks : 17

Part B: Content of the Course

Total Lectures: 30

Tentative Practical List	At least 14 experiments from the following: 1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in observations.

3. To study the motion of the spring and calculate
(a) Spring constant and, (b) g.

4. To determine the Moment of Inertia of a Flywheel.

5. To determine g and velocity for a freely falling body using Digital Timing Technique.

6. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).

7. To determine the Young's Modulus of a Wire by Optical Lever Method.

8. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

9. To determine the elastic constants of a wire by Searle's method.

10. To determine the value of g using Bar Pendulum.

11. To determine the value of g using Kater's Pendulum.

12. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c)DC Current, and (d) checking electrical fuses.

13. To compare capacitances using De'Sauty's bridge.

14. Measurement of field strength B and its variation in a Solenoid (DeterminedB/dx).

15. To study the Characteristics of a Series RC Circuit.

16. To study the series LCR circuit and determine its (a) Resonant Frequency, (b)Quality Factor.

17. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.

18. To determine a Low Resistance by Carey Foster's Bridge.

19. To verify the Thevenin and Norton theorem.

20. To verify the Superposition, and Maximum Power Transfer Theorem.

Part C - Learning Resource
Text Books, Reference Books, Other Resources

Reference Books:

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.

2. Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.

3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Link for e-Books for Physics: