

**SYLLABI AND SCHEME OF  
EXAMINATIONS  
FOR  
MULTIDISCIPLINARY COURSES  
FOR UNDER GRADUATE  
PROGRAMS (SINGLE MAJOR /  
MULTIDISCIPLINARY  
PROGRAMS)**

**(Based on Curriculum and Credit Framework for UG Programs under NEP)**



**WITH EFFECT FROM  
THE  
SESSION 2024-25**

**MAHARSHI DAYANAND UNIVERSITY  
ROHTAK (HARYANA)**

**SYLLABI AND SCHEME OF EXAMINATIONS FOR MULTIDISCIPLINARY COURSES FOR  
UNDER GRADUATE SINGLE MAJOR/MULTIDISCIPLINARY PROGRAMS/ SINGLE MAJOR  
PROGRAM AFTER 2<sup>nd</sup> SEMESTER OF MULTIDISCIPLINARY PROGRAM**

Name of the Department	Nomenclature of Multidisciplinary Course (MDC) @ 3 credits	Course Code	Credits Distribution			Total Credits	Workload			Total Workload	Marks				Total Marks
			L	T	P		L	T	P		Theory		Practical		
											Internal	External	Internal	External	
Physics	Physics Fundamentals-I	24PHY401MD01	02	0	01	03	02	0	02	04	15	35	05	20	75
Physics	Physics Fundamentals – II	24PHY402MD01	02	0	01	03	02	0	02	04	15	35	05	20	75
Physics	Physics Fundamentals – III	25PHY403MD01	02	0	01	03	02	0	02	04	15	35	05	20	75

**L: Lecture; T: Tutorial; P: Practical**

**Note:**

A student has to opt for three Multidisciplinary Courses in first three semester from the pool of the courses offered in the disciplines other than those of Major disciplines and Minor disciplines and the one not studied at 10+2 or equivalent level.

**Syllabi for Physics Fundamentals – I**  
**Semester-I**  
**Session: 2024-25**

<b>Name of Program</b>	Not to be filled	<b>Program Code</b>	Not be filled
<b>Name of the Course</b>	Physics Fundamentals – I	<b>Course Code</b>	4PHYS401MD01
<b>Hours per Week</b>	04(2+2)	<b>Credits</b>	03
<b>Maximum Marks</b>	Theory : 15+35 Practical: 05+20 Total : 75	<b>Time of Examinations</b>	Theory: 3 Hours Practical: 3 Hours

**Note:**

Examiner will set nine questions of seven marks each and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks

**Course Learning Outcomes (CLO):**

After completing this course, the learner will be able to

CLO1: Apply the concept of force and its role in describing interactions between objects and motion and gravity

CLO2: Use principles of energy conservation, work, and power in daily life events

CLO3: derive relations connecting physical quantities and check the correctness of physical relation

CLO4: Understand motion, velocity, acceleration, and their mathematical representations

**Unit 1:**

Physics-Nature, scope & excitement, Major discoveries in physics, major contribution by Indian Physicists, Fundamental physical constants, Physics in relation to other sciences, impact of physics on society and on latest development in science & technology. System of Measuring Units-Need for measurement, measuring process, concept of mass, length, time; Fundamental and derive units, system of units, concepts of error, types of error (only definition), Accuracy and precision in measurement, least count and applications of measuring instruments -Vernier calliper, Screw Gauge.

**Unit 2:**

Motion of objects in one dimension- position of the object, origin/reference point, frame of reference, definitions and examples of motion in one, two and three dimension, Scalar and Vector quantities, description of motion along a straight line- distance and displacement, uniform motion and non-uniform motion, average and instantaneous speed, average and instantaneous velocity, acceleration; graphical analysis of straight line motion- distance- time graph, velocity-time graph, equation of motions and their applications.

**Unit 3:**

Causes of motion- concept of force, Ist law of motion, inertia and mass; Newton's 2nd law of motion, momentum and force; Newton's 3rd law of motion, daily life applications of

Newton's laws of motion. Universal law of gravitation and its importance, acceleration due to gravity and free fall of a body; mass and weight of an object on earth and moon, concept of thrust and pressure and importance in daily life, buoyancy and Archimedes principle-the physics behind floating of objects on water.

**Unit 4:**

Work, energy, types of energy-Kinetic energy and Potential energy, P.E. of an object at a height; law of conservation of energy and its applications. Conservation of linear and angular momentum, collision (elastic and inelastic) and conservation laws in collisions- importance in daily life; concepts of centre of mass-Physics behind cycling, rock climbing and skating.

**Practicals:**

- 1 To measure the diameter of a small spherical / cylindrical body.
- 2 To measure the length, width and height of the given rectangular block.
- 3 To measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume.
- 4 Use of screw gauge:(i) to measure diameter of a given wire and (ii) to measure thickness of a given sheet
- 5 To determine radius of curvature of a given spherical surface by a spherometer.
- 6 To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination by plotting graph between force and  $\sin\theta$ .
- 7 To find the weight of a given body using parallelogram law of vectors.
- 8 Verification of Archimedes principle.
- 9 Verification of Work-energy theorem.
- 10 Acceleration due to gravity ( $g$ ) by bar pendulum.
- 11 To determine the moment of Inertia of a fly-wheel.
- 12 Study of law of conservation of linear momentum and Kinetic Energy.

**Note:** A student has to perform **at least eight (08)** experiments from the above list.

**References:**

- 1 Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
- 2 Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
- 3 Modern Physics (2nd edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
- 4 Physics for Scientists and Engineers with Modern Physics, 7th edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.
- 5 Physics for You, Fifth Edition, by Keith Johnson, OUP Oxford; 5th edition (23 June 2016).
- 6 B.Sc. Practical Physics, C. L. Arora, R Chand & Co. New Delhi
- 7 B.Sc. Practical Physics, Harnam Singh and Dr. P.S. Hemne, S Chand & Company Ltd.

**Semester-II****Session: 2024-25**

<b>Name of Program</b>	Not to be filled	<b>Program Code</b>	Not be filled
<b>Name of the Course</b>	Physics Fundamentals – II	<b>Course Code</b>	4PHYS402MD01
<b>Hours per Week</b>	04(2+2)	<b>Credits</b>	03
<b>Maximum Marks</b>	Theory : 15+35 Practical: 05+20 Total : 75	<b>Time of Examinations</b>	Theory: 3 Hours Practical: 3 Hours

**Note:**

Examiner will set nine questions of seven marks each and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks.

**Course Learning Outcomes (CLO):**

CLO1: Apply principles of light, electricity, and motion to analyse and solve real-world problems

CLO2: Evaluate experimental data to support laws of Physics and increase understanding of basic physics laws

CLO3: Recognize the linkages between fundamental physics principles and daily life activities

CLO4: Able to learn about basic electric circuits, fuse and effects of electric current

**Unit 1:**

Light and optics-Nature and properties of light, its speed, frequency and wavelength; Reflection of light-types of reflection and their importance in daily life, laws of reflection, multiple reflection by mirrors and their applications. Refraction of light- laws of refraction, refractive index, refraction of light through prism (dispersion of light), formation Rainbow, twinkling of stars, advance Sunrise and delayed Sunset; Scattering of light and blue colour of the sky; apparent depth, total internal reflection and its important applications.

**Unit 2:**

Image formation through reflection-images formed by plane mirrors, multiple images formed by two flat mirrors and optical illusions; images formed by parabolic mirrors and spherical mirrors- Concave and convex mirrors, ray diagrams, mirror equation and magnification; applications of plane and curved mirrors in daily life. Image formation through refraction-images by convex and concave lenses, ray diagrams and lens equation. Optical instruments-Camera, eye, telescope and microscope.

**Unit 3:**

Electricity- electric charge, types of charges, unit of charge, frictional electricity, electricity by conduction and electric current, units of electric current, measurement of current, conductors and insulators; resistance, resistivity and law, electric potential and potential difference, emf; Electric circuit- resistor, capacitor, battery, ammeter and voltmeter; Series and parallel combinations of resistors.

**Unit 4:**

Electrical wiring in houses and electrical safety (fuse, hot wire, neutral, ground and short circuit), electric power and electric power transmission; Heating effect of current and its

practical applications. Magnetic effect of electric current- Magnetic field and field lines, bar magnet, magnetic field and direction of field due to a current- through straight conductor and through a circular loop; solenoid, electromagnet.

**Practicals:**

- 1 To find the focal length of a convex mirror using a convex lens.
- 2 To find the value of  $v$  for different values of  $u$  in the case of a concave mirror and to find the focal length
- 3 To find the focal length of a concave lens using a convex lens.
- 4 To determine the refractive index of a glass slab.
- 5 To find the refractive index of a liquid using a convex lens and plane mirror
- 6 To determine the resistivity of different wires by plotting a graph for potential difference versus current.
- 7 To verify law for metallic conductor and to determine its resistance.
- 8 To find the frequency of AC mains with a sonometer.
- 9 Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses.
- 10 Use of Multimeter to check the working condition of diode, an LED, a resistor and a capacitor.

Note: A student has to perform atleast eight (08) experiments from the above list.

**References:**

- 1 Concept of Physics by H.C Verma (Part – I & II)
2. Essential University Physics, Vol-I & II by Richard Wolfson
3. Physics by Resnick, Halliday & Walker