



Department of Physics

Morigaon College (Autonomous)

NAAC accredited "A" grade

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Ref No.: PHY/MC(A)/2025/

Date: 22/11/2025

Following are the resolution of the board of studies:

1. The BoS committee approves the syllabus upto 3rd semester, FYUGP and these are attached herewith.
2. The minimum number of experiments to be conduct by each student is restricted to 5 for both major and minor course.
3. In semester 3, the BOS members approved the course the course "AI (Artificial intelligence) in Physics" as Skill enhancement course which is available in Samarth Portal.

Head of the Department

& Chairperson of BoS

Department of Physics

Morigaon College (Autonomous)

H O D PHYSICS
MORIGAON COLLEGE
Morigaon, 782105

Four Year Undergraduate Programme (FYUGP)

Subject: Physics (Major/Minor)

Semester -I

Course Name: Mathematical Methods-I, Mechanics and Properties of Matter

Existing base syllabus: HS Maths and Physics

Course Code: PHY-CORE-(MJ/MN)-MC-0100104

Syllabus showing each unit against class number and Marks

Total credit:04 (T:03, P:01)

Theory: (Credit: 03, Total Lecture=45)

Total Mark: 100 (ET: 45, INT:30, PRAC:25)

Part A: Mathematical Methods-I (Credit: 01, Total Lecture=15)

Topic	Details	Lectures
Unit-1: Scalar and Vector	Revision of scalar and vector, Vector addition and subtractions, Magnitude of a vector, Projection of a vector, Vector product (dot and cross) and their physical significance. Scalar triple Product, Vector triple Product, Physical examples and Problems.	04
Unit-2: Differentiation of Vector and scalar field	Scalar and vector field, Divergence, curl and gradient, Laplacian operator.	04
Unit-3: Vector Integration	Line integration, Surface integration, Volume integration. Gauss's theorem of divergence, Stokes's theorem.	05
Unit-4: Dirac delta function	Properties of dirac delta function, Expression in term of Gaussian and rectangular function, dirac delta function in 3D	02

Part B: Mechanics and Properties of Matter (Credit: 02, Total Lecture=30)

Topic	Details	Lectures
Unit-1: Frame of reference, Newton's laws of motion	Reference frame, Newton's laws of motion and their limitations, Inertial frame and non-inertial frame (Concepts of fictitious forces and applications). Galilean transformations. Rotating frame of reference and their transformation equations.	06
Unit-2: Centre of mass, collision and oscillations	Concept of centre of mass, Two body problem into single body problem. Collisions: elastic and inelastic collisions, Oscillations, simple pendulum and compound pendulum (Bar pendulum and Kater's Pendulum)	05
Unit-3: Work energy principle & Gravitation	Work-energy principle, Physical examples, Conservation law and conservation forces, Force as a gradient of potential energy, Work done by non-conservative forces, Central force, Kepler's law, Gauss's law in gravity and Poisson's equation for Gravitational field.	04
Unit-4: Dynamics of rigid body	Rigid body, Axis of rotation, kinematics in rotational motion, Moment of inertia of different bodies (Rectangular lamina, disc, cylindrical and spherical bodies).	04
Unit-5: Elasticity	Behaviour of solid, Stress and strain and their relations (Hooke's law), different elastic constants, Relation between elastic constants, Bending of beam.	04
Unit-6: Properties of liquid	Surface properties of liquid, Surface tension, Molecular theory of surface tension, Pressure inside bubble and liquid drop. Viscosity, stream-lined motion, laminar flow, Poiseuille's equation for flow of a liquid through a pipe, Reynolds number, Bernoulli's theorem, Stokes's theorem in liquid.	07

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Practical: (Credit 01)

Minimum 5 experiments are compulsory

1. To verify the Hooke's law, using an ordinary spring.
2. To determine the acceleration due to gravity using Bar pendulum
3. To determine the acceleration due to gravity using Kater's Pendulum
4. To determine the surface tension of a liquid using Jurin's method
5. To determine the Moment of inertia of an irregular body using a regular body
6. To determine the Moment of inertia of a regular body about different axis of rotation.
7. To determine the Young's modulus of elasticity.
8. Using static method, determine the modulus of rigidity of a rod.
9. To determine the final velocity of a freely falling body, and hence find the acceleration due to gravity.

Learning Outcome:

On successful completion of the course, the students will be able to understand the calculus of vectors and the concept curve spaces which play central rules in developing inside of the theories of Physics. Moreover, the students will be able to understand and apply the concepts of dynamics of particles, energy, oscillation and basic properties of matter in various problems of basic Physics, and engineering physics. They will be trained in concepts realization through laboratory practices.

Course objective:

The basic objectives are:

- * To introduce essential primary concepts in mathematical methods in Physics, such as Vector and scalars, followed by their differentiation and integration and dirac delta functions.
- * To introduce the concepts of dynamics of particles, energy, oscillations and basic properties of matter.
- * To train students with the concept of visualization through some laboratory experiments.

Reading references:

- [1] Mechanics, D.S. Mathur (Revised by P.S. Hemne), S. Chand & Company Limited. (Rev. edition)
- [2] Mathematical Physics, B.S. Rajput, Pragati Publications
- [3] Theoretical Mechanics, M.R. Spiegel., Tata McGraw Hill
- [4] The Feynman Lectures on Physics (Vol. 1), Feynman, Leighton & Sands, Pearson Publication
- [5] Elements of Properties of Matter, D.S. Mathur, S. Chand & Com. Ltd.
- [6] Mathematical Physics, HK Dass, R. Verma & R. Verma, S. Chand & Com. Ltd
- [7] Mathematical Methods for Physicists, Arfken, Weber & Harris, Elsevier

Particulars of course designer:

- [1] Babul Talukdar, Asso. Professor, Morigaon College, Morigaon Assam
- [2] N.I. Ali Ahmed, Asso. Professor, Morigaon College, Morigaon Assam
- [3] Dr. Hemanga Jyoti Sarmah, Asst. Professor, Morigaon College, Morigaon Assam
- [4] Ujjal Medhi, Asst. Professor, Morigaon College, Morigaon Assam
- [5] Fariza Shahnaz Akhtar, Asst. Professor, Morigaon College, Morigaon Assam

Four year undergraduate Programme

Subject: Skill Enhancement Course (SEC)

Semester -I

Course Name: Physics Workshop Skill

Existing base syllabus: NA

Course Code: SEC-PHY-MC-0100103

Syllabus showing each unit against class number and Marks

Total credit:03 (T:02, P:01)

Total Mark: 75 (ET: 30, INT: 30, PRAC:15)

Theory: (Credit: 02, Total Lecture=30)

Topic	Details	Lectures
Introduction	Measurement unit and their conversion (SI to CGS and vice versa). Familiarization with screw gauge, meter scale, vernier calliper, Spherometer, sextant meter	08
Electrical measurement tools	Voltmeter, Ammeter, Multi-meter. Galvanometer, conversion of galvanometer to voltmeter and ammeter. Resistance and capacitance, Resistance measurement using multi-meter and Color code.	10
Semiconductor devices	Semiconductor, doping, Fermi level, energy gap, Diode, Zener diode, Solar cell, Transistor, Electrical Measurement	10
Cathode Ray oscilloscope	Cathode ray, Working principle of CRO and signal analysis	07

Practical

Minimum 5 experiments are compulsory

1. To measure the diameter of wire using screw gauge.
2. To measure the volume of a cube using vernier calliper
3. To determine the distance between two points using travelling microscope.
4. Test equipment and electrical parameters using multi-meter
5. Using CRO, measure frequency and amplitude of electrical signals (Voltage)
6. Measure the height of a building using sextant meter.
7. Solder two wires or component.
8. Identify PNP and NPN transistor using multi-meter.

Learning Outcome:

On successful completion of the course, the students will be able to learn about the instruments and their utility. These will help them to develop their skill in experiments and laboratory activities.

Course Objective:

The basic objectives are:

- * To introduce essential primary concepts in basic instrumentation in Physics
- * To develop the laboratory skill.

Reading references:

- [1] Principle of Electronics, Mehta & Mehta, S. Chand & Company Limited.
- [2] Laboratory Physics, Ratnewar Sarma, Moni Manik Prakash
- [3] A modern approach to B.Sc Practical Physics, Shymprasad Sharma, K.M. Publication

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