

Shri Acharyaratna Deshbhooshan Shikshan Prasarak Mandal, Kolhapur

Mahavir Mahavidyalaya, Kolhapur

(Autonomous)

Affiliated to Shivaji University, Kolhapur



Syllabus for Choice Based Credit System (NEP 2020)

Bachelor of Science (B. Sc.) Programme

Part	I	Course	Physics
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Under the Faculty of Science & Technology

(To be introduced from Academic Year 2025 – 26 onwards)

Subject to the revisions & modifications made from time to time

Mahavir Mahavidyalaya, Kolhapur (Autonomous)
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(New syllabus under Autonomy to be introduced from June, 2025 onwards)

Primary Information:			
Programme	Bachelor of Science (B. Sc.) NEP		
Part	I	Semester	I
Course	Physics	Course Code	DSC-A1
Paper No.	I	Course Type	Semester
Total Marks	50 Marks	Implementation	2025 – 26
Total Credits	02	Contact Hours	04 / Week
Course Title	Mechanics I		

Course Objectives:		
i)	Learn scalar, vector, derivatives.	
ii)	Study Newton's laws of motion.	
iii)	Study conservation of energy, centre of mass.	
iv)	Study rotational motion & moment of inertia of various bodies.	
Course Syllabus (CR = Credits / IH: Instructional Hours)		
Modules	CR	IH
Module I :		
<p>Unit I - Vector: Scalar and vector product, Derivatives of a vector with respect to parameter (velocity & acceleration).</p> <p>Unit II - A) Ordinary Differential Equation: Differential Equation- Ordinary & partial differential equation, 1st order homogeneous differential equation, 2nd order homogeneous differential equation with constant coefficients.</p> <p>B) Laws of motion: Introduction, frame of reference, Inertial & Non-inertial frame of reference, Newton's laws of motion and their proof.</p>	01	15

Module II :		
<p>Unit I - Rotational motion: Introduction, Angular velocity, angular momentum, angular displacement, angular acceleration and torque, System of particle-Centre of mass, Moment of Inertia (in short).</p> <p>Unit II - Dynamics of a system of particles: Conservation of linear and angular momentum, work and energy theorem, conservation of energy (single particle), Dynamics of system of particles (linear momentum, angular momentum and energy), Centre of mass.</p>	01	15

Course Outcomes:
On completion of the course, students will be able to:
i) Understand concept of scalar, vector and their product.
ii) Understand difference between partial and ordinary differential equations.
iii) Understand rotational motion and moment of inertia of various bodies.

Primary Information:			
Programme	Bachelor of Science (B. Sc.) NEP		
Part	I	Semester	I
Course	Physics	Course Code	DSC-A2
Paper No.	II	Course Type	Semester
Total Marks	50 Marks	Implementation	2025 – 26
Total Credits	02	Contact Hours	04 / Week
Course Title	Electricity & Magnetism I		

Course Objectives:	
i)	To study the gradients, divergence, curl and their physical significance.
ii)	To study the Electrostatics field, Electrostatics theorem & electrolytic capacitors.
iii)	To study dielectric medium and three electric vectors.

Course Syllabus (CR = Credits / IH: Instructional Hours)		
Modules	CR	IH
Module I:		
<p>Unit I - Vector Analysis : Vector algebra, Gradient, divergence, Curl and their significance, Vector Integration, surface and volume integrals of vector fields, divergence theorem and stokes theorem of vectors (statement only).</p> <p>Unit II – Electrostatics I : Electrostatics field, Electric flux, Gauss’s theorem of electrostatics, electric potential as line integral of electric field, potential due to charge ,electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential.</p>	01	15

Module II :		
<p>Unit I – Electrostatics II : Capacitance of an isolated spherical conductor parallel plate, spherical and cylindrical condenser, energy per unit volume in electrostatic field.</p> <p>Unit II – Dielectrics : Polarisation of dielectric and polarisation vector, displacement vector, electric vector, relation between E, P and D vectors, electric susceptibility of dielectrics.</p>	01	15

Course Outcomes:
After completion of the unit, students will be able to:
i) Understand significance of gradient, divergence and curl.
ii) Calculate electrostatics field and potential of charge distribution using Gauss's law.
iii) Understand the relation between three electric vector

Primary Information:			
Programme	Bachelor of Science (B. Sc.) NEP		
Part	I	Semester	II
Course	Physics	Course Code	DSC-B1
Paper No.	III	Course Type	Semester
Total Marks	50 Marks	Implementation	2025 – 26
Total Credits	02	Contact Hours	04 / Week
Course Title	Mechanics II		

Course Objectives:	
i)	To study Gravitation.
ii)	To study oscillations.
iii)	To study types of pendulum.
iv)	To study surface tension.

Course Syllabus (CR = Credits / IH: Instructional Hours)		
Modules	CR	IH
Module I :		
<p>Unit I - Gravitation : Newton's law of Gravitation, Motion of particle in central force field, Satellite in a circular orbit, Geosynchronous orbits, Basic idea of GPS.</p> <p>Unit II - Oscillations : SHM, types of oscillation, differential equation of SHM, Energy of SHM, solution for equation of SHM, Compound pendulum, Kater's pendulum, Bessel's formula, bifilar pendulum.</p>	01	15

Module II:		
<p>Unit I – Elasticity : Bending of beam, bending moment, cantilever (without considering weight of cantilever), beam supported at both ends (without considering weight of beam).</p> <p>Unit II - Surface Tension : Surface tension, angle of contact and wettability, relation between surface tension, excess of pressure and radius of curvature, experimental determination by Jaegers method, Applications of Surface tension.</p>	01	15

Course Outcomes:
After completion of the unit, students will be able to:
i) Understand oscillations, gravitation, pendulums.
ii) Understand elasticity and surface tension.

Primary Information:			
Programme	Bachelor of Science (B. Sc.) NEP		
Part	I	Semester	II
Course	Physics	Course Code	DSC-B2
Paper No.	IV	Course Type	Semester
Total Marks	50 Marks	Implementation	2025 – 26
Total Credits	02	Contact Hours	04 / Week
Course Title	Electricity & Magnetism II		

Course Objectives:	
i)	To study Growth and decay of current.
ii)	To study LCR series circuit and AC bridge.
iii)	Understand magnetic properties of materials.
iv)	Learn electromagnetic induction laws.

Course Syllabus (CR = Credits / IH: Instructional Hours)		
Modules	CR	IH
Module I :		
<p>Unit I – Magnetism I : Magnetostatic : Bio-Savart’s law and its application, Straight conductor, circular coil, solenoid carrying current, Divergence and Curl of Magnetic field, Magnetic Vector potential, Ampere’s circuital law,</p> <p>Unit II - Magnetism II : Magnetic properties of materials, Magnetic intensity, Magnetic induction, Permeability, Magnetic susceptibility, Brief introduction of dia- magnetic, para- magnetic and ferro-magnetic materials.</p>	01	15

Module II :		
<p>Unit I – Electromagnetic Induction : Faraday's laws of electromagnetic induction, Lenz's law, Self and mutual inductance, Self inductance of single coil, Mutual inductance of two coils, Energy stored in magnetic field.</p> <p>Unit II – A.C. Circuits : Complex numbers and their application in solving AC series LCR circuit, Complex Impedance, Reactance, Admittance and Susceptance, Resonance in series LCR circuit, Sharpness of resonance (qualitative treatment only), Q factor(definition), AC Bridge- Owen's Bridge.</p>	01	15

Course Outcomes:
After completion of the unit, students will be able to:
i) Define Complex Impedance, Reactance, Admittance and Susceptance, Resonance.
ii) Learn application of Biot-Savart law in straight conductor, circular coil and solenoid.
iii) Determine energy stored in magnetic field.

Practical Course

Course Objectives:
1. Learn measuring skills in practical.
2. To make the students aware about handling of instruments .
3. To make them aware of basic components.

Course Syllabus (CR = Credits / IH: Instructional Hours)		
SEMISTERS	CR	IH
SEM I		
<p>GROUP A -</p> <ol style="list-style-type: none"> 1) Measurements of length using vernier calliper, screw gauge and travelling microscope. 2) Moment of Inertia of a disc using auxiliary ring. 3) Moment of Inertia of a flywheel. 4) Determine g by Bar pendulum. 5) Determine g by Kater's pendulum. 6) Study exponential decay of amplitude of simple pendulum 7) To study the motion of a spring and calculate <ol style="list-style-type: none"> a) Spring Constant b) value of g. <p>GROUP B –</p> <ol style="list-style-type: none"> 1) Testing of component. 2) To use a Multimeter for measuring <ol style="list-style-type: none"> a)Resistance b)AC and DC voltage c)DC current d) Checking electrical fuses. 3) Thevenin /Norton theorem. 4) High resistance by Leakage Method. 	02	

SEM II		
<p>GROUP A -</p> <ol style="list-style-type: none"> 1) Surface Tension by Jaeger's method. 2) Young's modulus of a material of Bar by vibration. 3) Modulus of rigidity of material of wire by torsional oscillation. 4) Poission's ratio for using rubber tube. 5) Y/η of wire by Searle's method. 6) To level the prism table using spirit level & optical method & hence determine angle of prism using spectrometer. <p>GROUP B -</p> <ol style="list-style-type: none"> 1) Impedance of series LCR. 2) Series LCR circuit and determine it's <ol style="list-style-type: none"> a) Resonant Frequency b) Quality factor Q. 3) Parallel LCR circuit and determine it's <ol style="list-style-type: none"> a) Anti-resonant Frequency b) Quality factor Q. 4) Frequency of A.C.mains by Sonometer. 5) Determine low resistance by Carey Foster's bridge. 6) Measurement of field strength B and its variation in a Solenoid (determine dB/dx). 	02	

Course Outcomes:
<ul style="list-style-type: none"> • On completion of this course students will be expected to:
1) Learn measuring skills in practical.
2) Understand theoretical concepts by performing experiments.
3) To handle various instruments.
4) Develop awareness of minimizing errors

Text Books for Reading	
1.	Phadke Prakashan
2.	Nirali Prakashan
Books for Reference	
1.	Principles of physics-walker, Holiday, Resnick, 10th edition.
2.	Physics-S.G sterling and Woodal, Longmans & Green Co.Ltd.
3.	Mechanics- Berkely physics course, Charles kittle, Tata Mc Graw Hill publication.
4.	Mathematical physics- Hobson M.P, Bence S.J., Cambridge university press, 3rd edition, 2006.
5.	Electricity & Magnetism :D.C.Tayal, Himalaya publishing House,1988
6.	Concepts of physics Vil-2 H.C.Verma.
7.	Electromagnetics- B.B Laud.
8.	Electricity and Magnetism: J.H Fewkes and John yarhood, Vol I, publication by Oxford university press, 5th edition.
Books for Practical	
1.	A text book of practical physics-Shrinivasan and Balasubramanyam.
2.	Practical physics-Gupta and kumar (pragatiprakationMeerat)
3.	Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
4.	Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4thEdition, reprinted 1985, Heinemann Educational Publisher
5.	Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.

Suggested methods of Teaching:	
i)	Offline Traditional Board Teaching
ii)	Power Point Presentation
iii)	Online Teaching on platform of Zoom or Google Meet

Scheme of Course Evaluation		
1.	End Semester Examination (ESE)	30
2.	Continuous Internal Evaluation (CIE)	20
3.	Total Marks	50

Suggested techniques for Continuous Internal Evaluation (20 Marks)	
1.	Assignments
2.	Offline / online MCQ test
3.	Unit test
4.	Open book test
5.	Seminar

Question Paper Pattern (30 Marks) Theory Exam		
Q. No.	Nature / Type of Question	Marks
1.	Multiple Choice Questions (MCQ) 6 Questions	6 Marks (1 Marks for each question)
2.	Short Answer Questions Attempt any 4 out of 6 questions	12 Marks (3 Marks for each question)
3.	Essay type /Broad Questions Attempt any 2 out of 3 questions	12Marks (6 Marks for each question)
	Total	30 Marks

Practical Examination

(A) The practical examination will be conducted on one day for three hours per day per batch of the practical examination.

(B) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed in a satisfactory manner the practical course on lines laid down from time to time by Academic Council on the recommendations of Board of Studies and that the journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and have written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of the semester. Candidates must produce their journals at the time of practical examination.

Question Paper Pattern (50 Marks)		
Semester wise Practical Exam		
Semester	Nature / Type of Question	Marks
III	Group I : One experiment	20
	Group II : One experiment	20
	Certified Journal (05 marks) & Oral (05 marks)	10
	Total Marks (For Semester I)	50
IV	Group III : One experiment	20
	Group IV : One experiment	20
	Certified Journal (05 marks) & Oral (05 marks)	10
	Total Marks (For Semester II)	50
Total Marks		100