

LIST OF MAJOR PAPERS IN B.Sc. PHYSICS (NEP-2022)

FOR THE SESSION 2026-27

B.Sc. Four Year Program in Physics as per NEP (2022)

NHEQF Level	SEM	Course Type	Course Code	Courses Title	L	P	H/W	Credits
4.5	I	MJR	08/PHY/MJR/101T	Mechanics	4	-	4	4
		MJR-P	08/PHY/MJR/101P	Mechanics Lab-I	-	2	4	2
		MJR	08/PHY/MJR/102T	Waves and Oscillations	4	-	4	4
		MJR-P	08/PHY/MJR/102P	Mechanics Lab-II	-	2	4	2
4.5	II	MJR	08/PHY/MJR/151T	Optics-I	4	-	4	4
		MJR-P	08/PHY/MJR/151P	Optics Lab-I	-	2	4	2
		MJR	08/PHY/MJR/152T	Optics-II	4	-	4	4
		MJR-P	08/PHY/MJR/152P	Optics Lab-II	-	2	4	2

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02/06/26

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Undergraduate Programme (PHYSICS) Syllabus, Semester-I

Session -2026-2027

Part-A

Subject	Physics
Semester	I
Name of Course	Mechanics
Course Code	08/PHY/MJR/101T
Course Type:	Major
Level of Course	100-199
Pre-requisite for course	--
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1: Analyse the elastic behaviour of materials and various elastic constants CLO2: Evaluate torsional properties of cylinders and determine elastic constants CLO3: Analyse the concepts of frames of reference and inertial and non-inertial frames, apply Galilean transformations. CLO4: Analyse effects of centrifugal and Coriolis force on bodies. CLO5: Learn about basics of the Special Theory of Relativity and its results
Credits	4
Total Marks	20+80=100

Part-B Contents of the Course

Total Lectures per Week		4 (Theory)	
UNITS	TOPICS	No. of Lectures	
I	Elasticity: Stress and strain, Hooks's law, Young's modulus, Bulk modulus and modulus of rigidity, Poisson ratio, relation between various elastic constants, Theory of bending of a beam, bending moment in beam, cantilever, experimental determination of Y by loading a beam in the middle	12	
II	Torsion of a cylinder, torsional constant, experimental determination of η by static method (Barton's apparatus) and dynamic methods (Mexwell's needle), experimental determination of Poisson ratio using rubber tube, elastic constants using Searle's two bar experiment.	12	
III	Frames of Reference: Cartesian coordinate system, Inertial frames, Galilean transformations, transformations in inclined frames, non-inertial frames, fictitious forces, transformations of displacement, velocity and acceleration in rotating frames, Centrifugal and Coriolis force in rotating frames.	12	
IV	Motion relative to earth: effect of Coriolis force on a particle falling freely and that on particle thrown upward vertically, Focault's pendulum. Center of mass, Laboratory and CM frames of reference, head on elastic collision in laboratory and CM frame.	12	
V	Special Theory of Relativity: Invariance of c, Michelson-Morley Experiment, Lorentz transformations, addition of velocities, time dilation and length contraction, conservation of momentum in collision at relativistic speeds and variation of mass with velocity, relativistic mass-energy relation.	12	

Activities:

Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation:
Case Debates and Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1. Berkeley: Physics Course, Vol. I, Mechanics, Tata McGraw Hill, New Delhi.
2. R. S. Gambhir: Mechanics, CBS Publishers.
3. J.C. Upadhyaya: Mechanics, Ram Prasad & Sons, Agra.
4. Mechanics, D.S. Mathur, S.Chand & Co.
5. Mechanics, College Book House

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Undergraduate Programme (PHYSICS) Syllabus, Semester-I

Session -2026-2027

Part-A

Subject	Physics
Semester	I
Name of Course	Mechanics Lab-I
Course Code	08/PHY/MJR/101P
Course Type:	Major
Level of Course	100-199
Pre-requisite for the course	--
Course Learning Outcomes (CLO)	The students will be able to learn and measure elastic properties of rods, wire, rubber etc. They will get an idea of the order of the magnitude of the elastic properties and can relate that with the performance.
Credits	2
Total Marks	10+40=50

Part-B Contents of the Course

Total Lectures per Week	4 (Practical)
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Students will perform following experiments-

1. Determination of Young's modulus by bending of a beam.
2. To determine Young's modulus of the material of a given wire.
3. Determination of Modulus of rigidity by statical method using Barton's apparatus (horizontal mode).
4. Determination of Modulus of rigidity by statical method using Barton's apparatus (vertical mode).
5. Determination of Elastic constants by Searle's method.
6. To determine the Poisson's ratio of a rubber tube.
7. Determination of surface tension of water by Jagger's method.
8. To Determine Moment Of Inertia Of Flywheel
9. Verification of Hooke's law

Note: - New experiments may be added on availability of equipments.

Activities:

Classroom Discussion and Concept Clarification:

Short written assignments/Class notes:

Group Discussions and Presentation :

Case Debates and Interactive Sessions:

Study / Contemporary Issue Analysis:

Part-C Learning Resources**Recommended books**

1. Practical Physics, Pragati Prakashan, Meerut
2. Practical Physics, College Book House
3. B. Sc. Practical Physics, CL Arora, S. Chand Publications

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Undergraduate Programme (B.A. XI) Scheme, Semester I

Session 2021-2022

Part A

Subject	Physics
Semester	I
Name of a course	Waves and Oscillations
Course Code	BA B.A. XI-XI 101
Course Type	Major
Level of a course	UG-UG
Prerequisite for the course	
Course Learning Outcomes (CLOs)	The completion of this course would be able to CLO-1: Know the physics of simple harmonic oscillations by using mechanical systems. CLO-2: Explain the dynamics of coupled systems involving coupled oscillations and concept of resonance. CLO-3: Predict the dynamics of damped and forced oscillations. CLO-4: Explain mathematical models for one-dimensional wave propagation to determine velocity of waves. CLO-5: Apply Fourier analysis and superposition principles to decompose periodic waveforms.
Credits	4
Total Marks	100

Part B Contents of the Course

Topic	Topic	No. of Lectures
1	Oscillations: Qualitative idea of oscillations in an arbitrary potential well, classical differential equation for the harmonic motion and its solution, linear harmonic oscillation and its velocity, kinetic energy, potential energy, Oscillations of mass on a spring, oscillations of two connected springs in series and parallel, Compound pendulum, Kater's pendulum.	12
2	Oscillation of two masses connected by a spring, reduced mass, coupled oscillations, normal modes, normal coordinates of two linear coupled oscillations, superposition of two orthogonal SHMs, Lissajous figures for frequency in the ratio 1:1 and 2:1.	12
3	Damped harmonic motion: motion of equation and solutions, various kinds of damping in damped harmonic motion, logarithmic decay, forced oscillations: motion of equation and solutions, resonance, transient and steady state oscillations, power absorbed by a forced oscillator, Resonance width and quality factor.	12
4	Wave motion: General differential equation of one dimensional and three dimensional wave motion and their solutions, plane progressive harmonic wave, differential calculus methods for speed of transverse waves on a uniform string and for that of longitudinal waves in a fluid.	12
5	Newson's formula for velocity of sound, Laplace correction, Energy density and energy transmission in waves, superposition of waves, group and phase velocity, Fourier series, Fourier coefficients, Fourier analysis of square wave, Fourier analysis of saw-tooth waves.	12

Additional:
 1. Harmonic Oscillation and 2. Coupled Oscillations
 These topics are compulsory for all.
 Group Oscillation and Resonance
 Case Studies & an Interactive Session
 Study, Contemporary Issue Analysis.

Part C Learning Resources

- Recommended Books**
1. Resnick: Physics Course, Vol. III, Waves and Oscillations, McGraw Hill, New Delhi.
 2. A. P. French: Physics of Vibration and Waves.
 3. J. C. Upadhyaya: Mechanics, Ram Prasad & Sons, Agra.
 4. Mechanics, D. S. Mathur, S. Chand & Co.
 5. Mechanics, College Book House

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Undergraduate Programme (PHYSICS) Syllabus, Semester-I

Session -2026-2027

Part-A

Subject	Physics
Semester	1
Name of Course	Mechanics Lab-II
Course Code	08/PHY/MJR/102P
Course Type:	Major
Level of Course	100-199
Pre-requisite for course	---
Course Learning Outcomes (CLO)	The students will be able to learn and measure time periods and other properties and will be able to analyse the characteristics of simple harmonic motion, damped harmonic motion and forced oscillations.
Credits	2
Total Marks	10+40=50

Part-B Contents of the Course

Total Lectures per Week 4 (Practical)

Students will perform following experiments-

1. To determine g by studying oscillations of a bar pendulum.
2. To determine the restoring force per unit extension of a spiral spring by statistical method.
3. To determine the restoring force per unit extension of a spiral spring by dynamical method.
4. Determination of Modulus of rigidity by dynamical method using hollow Maxwell needle.
5. Determination of Modulus of rigidity by dynamical method using solid Maxwell needle.
6. To determine time period of a compound pendulum
7. To study effect of air damping on the oscillatory motion of simple pendulum
8. To study effect of air damping on the oscillatory motion of a compound pendulum.
9. To determine the value of g using Katers Pendulum.
10. Determination of frequency of a tuning fork using sonometer (transverse waves).

Note: - New experiments may be added on availability of equipments.

Activities:

Classroom Discussion and Concept Clarification:

Short written assignments/Class notes:

Group Discussions and Presentation :

Case Debates and Interactive Sessions:

Study / Contemporary Issue Analysis:

Part-C Learning Resources

Recommended books

1. Practical Physics, Pragati Prakashan, Meerut
2. Practical Physics, College Book House
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Undergraduate Programme (PHYSICS) Syllabus, Semester-II

Session -2026-2027

Part-A

Subject	Physics
Semester	II
Name of Course	Optics-I
Course Code	08/PHY/MJR/151T
Course Type:	Major
Level of Course	100-199
Pre-requisite for course	--
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1: evaluate the behaviour of co-axial lens systems by identifying and calculating cardinal points. CLO2: Differentiate between Ramsden and Huygens eyepieces to calculate and minimize spherical and chromatic aberrations. CLO3: Analyse the principles of interference and some important interference patterns CLO4: Apply interferometric techniques to measure optical parameters, such as wavelength, refractive index etc. CLO5: Describe the fundamental concepts and working principles of lasers and optical fibres together with their applications.
Credits	4
Total Marks	20+80=100

Part-B Contents of the Course

Total Lectures per Week		4 (Theory)	No. of Lectures
UNITS	TOPICS		
I	Geometrical Optics: laws of refraction and reflection, Refraction at a spherical surface, Axial, Lateral and angular magnifications and their inter-relationship, Abbe's Sine condition for spherical surfaces, Focal length of a thin lens, Focal length of two thin lenses separated by a distance, Cardinal points of a co-axial lens system, properties of cardinal points, construction of image using cardinal points, Newton's formula.		12
II	Aberration: Spherical Aberration, Methods to reduce spherical aberration, Chromatic Aberration in lenses, axial and lateral chromatic aberration, Achromatism for two thin lenses in contact and separated by a distance, Optical instruments: Ramsden's eye piece: cardinal points and formation of image, Huygen's eye pieces: cardinal points and formation of image, spectrometer: principle and working.		12
III	Interference: Concept of Spatial and temporal coherence, coherence length, coherence time, Division of wavefront: Fresnel's Bi-Prism, Measurement of wavelength and thickness of a thin transparent sheet using Fresnel's Bi-Prism, Division of Amplitude: Interference exhibited by thin film, Interference exhibited by wedge-shaped films, Haidinger Fringes; Fizeau Fringes.		12
IV	Newton's rings: Formation of Newton's rings, determination of wavelength and refractive index of a liquid by Newton's rings, Michelson Interferometer: Constructions and working, Measurement of wavelength and difference between two close wavelengths, Fabry-Perot interferometer: Construction and working, Intensity Distribution, Co-efficient of sharpness and half width, measurement of wavelength.		12
V	Lasers: Population inversion, laser as source of coherent radiation, Einstein's coefficients and their inter relations, Basic principles of He-Ne Laser and Ruby Laser, Applications of Lasers, Introduction to optical fiber, types of optical fiber, propagation of light through an optical fiber		12

Activities:

Classroom Discussion and Concept Clarification:
Short written assignments/Class notes:
Group Discussions and Presentation:
Case Debates and Interactive Sessions:
Study / Contemporary Issue Analysis:

Part-C Learning Resources

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Undergraduate Programme (PHYSICS) Syllabus, Semester-II	
Session -2026-2027	
Part-A	
Subject	Physics
Semester	II
Name of Course	Optics Lab-I
Course Code	08/PHY/MJR/151P
Course Type:	Major
Level of Course	100-199
Pre-requisite for course	None
Course Learning Outcomes (CLO)	Students will develop the ability to experimentally determine key optical properties—such as focal length, wavelength, refractive index, and dispersive power—using lens combinations, Newton's rings, and prism-based methods.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	4 (Practical)
Students will perform following experiments- 1. Determination of focal length of combination of two lenses, separated by finite distance using nodal slide. 2. Determination of wavelength of monochromatic light (Sodium/ Laser) by Newton's rings. 3. Determination of refractive index of given liquid by Newton's rings. 4. Determination of dispersive power of prism 5. Determination of refractive index of material of prism. 6. Verification of laws of reflection and refraction using optical bench. 7. Determination of angle of a prism using a spectrometer. 8. Determination of difference between two close wavelengths using Michelson interferometer. 9. Study of numerical aperture of an optical fiber. Note: - New experiments may be added on availability of equipment.	
Activities: Classroom Discussion and Concept Clarification: Short written assignments/Class notes: Group Discussions and Presentation : Case Debates and Interactive Sessions: Study / Contemporary Issue Analysis:	
Part-C Learning Resources	
Recommended books 1. Practical Physics, Pragati Prakashan, Meerut 2. Practical Physics, College Book House 3. B. Sc. Practical Physics, CL Arora, S. Chand Publications	

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Undergraduate Programme (PHYSICS) Syllabus, Semester-II
Session -2026-2027

Subject	Physics
Semester	II
Name of Course	Optics-II
Course Code	08/PHY/MJR/152T
Course Type:	Major
Level of Course	100-199
Pre-requisite for course	==
Course Learning Outcomes (CLO)	After completing the Course students would be able to CLO1: Explain the fundamental concepts of diffraction CLO2: Analyze diffraction patterns quantitatively CLO3: Explain the fundamental concepts of plane transmission gratings CLO4: Explain the fundamental concepts of polarization CLO5: Evaluate methods for production and measurement of polarized light
Credits	4
Total Marks	20+80=100

Part-B Contents of the Course

Total Lectures per Week		Part-B Contents of the Course	
		4 (Theory)	
UNITS	TOPICS		No. of Lectures
I	Diffraction: Types of diffraction, Fresnel's class of diffractions: Fresnel's half period zones, radius and area of HPZs, Zone Plate, Phase reversal zone Plate, Fresnel's Diffraction due to a circular aperture, cylindrical wave front and its effect at an external point and geometrical construction, diffraction of cylindrical wave front at a straight edge.		12
II	Fraunhofer class of diffraction: diffraction due to a single slit and Amplitude and phase and intensity distribution, central and secondary maxima, Fraunhofer Diffraction due to a circular aperture, Diffraction at two slits and intensity distribution, missing orders, Diffraction at N slits and intensity distribution, principal and secondary maxima.		12
III	Plane Transmission Grating: Theory and formation of spectra, width of principal maxima, absent spectra, overlapping of spectral lines, number of spectra, dispersion by grating, measurement of wave-length of light, Rayleigh's criterion, Resolving Power of a Prism and plane transmission grating.		12
IV	Polarization: Double refraction, production of plane polarized light by double refraction, Nicol Prism: its construction and working, Double refraction in uniaxial crystals, Huygen's explanation of Double Refraction, Plane, circular and elliptically polarized light, Half-wave and quarter-wave plates		12
V	Production and detection of plane, circularly and elliptically polarized light by Nicol Prism and Quarter-wave plate, Rotatory Polarization, Fresnel's explanation, Malus law, specific rotation, half shade and Biquartz Polarimeter, determination of specific rotation and strength of sugar solution.		12

Activities:
Classroom Discussion and Concept Clarification;
Short written assignments/Class notes;
Group Discussions and Presentation ;
Case Debates and Interactive Sessions;
Study / Contemporary Issue Analysis;

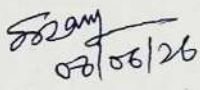
Part-C Learning Resources

Recommended books

1. A text book of Optics, Subramanayam and Brjllal: S. Chand, New Delhi.
2. Optics, AK Ghatak, Tata McGraw Hill.
3. Jenkins and White: Optics, McGraw Hill
4. Optics, College Book House, Jaipur
5. Optics, Jaipur Publishing House, Jaipur

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Undergraduate Programme (PHYSICS) Syllabus, Semester-II	
Session -2026-2027	
Part-A	
Subject	Physics
Semester	II
Name of Course	Optics Lab-II
Course Code	08/PHY/MJR/152P
Course Type:	Major
Level of Course	100-199
Pre-requisite for course	--
Course Learning Outcomes (CLO)	Students will able to develop the ability to investigate diffraction, polarization, and optical activity by determining wavelength, resolving power, and specific rotation using grating, prism, polarimeter, and laser-based experiments.
Credits	2
Total Marks	10+40=50
Part-B Contents of the Course	
Total Lectures per Week	4 (Practical)
Students will perform following experiments- 1. Determination of wavelength of light by plane transmission grating. 2. Determination of resolving power of a prism 3. Verification of Malus's law. 4. Determination of resolving power of a plane transmission grating. 5. To study Fraunhofer diffraction using Laser. 6. Production and analysis of circular and elliptical polarized light using quarter-wave plate. 7. Determination of specific rotation of sugar solution using a polarimeter (half-shade method). 8. Determination of concentration of sugar solution using a polarimeter (biquartz method). Note: - New experiments may be added on availability of equipments.	
Activities: Classroom Discussion and Concept Clarification: Short written assignments/Class notes: Group Discussions and Presentation : Case Debates and Interactive Sessions: Study / Contemporary Issue Analysis:	
Part-C Learning Resources	
Recommended books 1. Practical Physics, Pragati Prakashan, Meerut 2. Practical Physics, College Book House 3. B. Sc. Practical Physics, CL Arora, S. Chand Publications	


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