

Chaudhary Bansi Lal University, Prem Nagar

(A State University established under Haryana Act No. 25 of 2014)



Scheme of Examination for Physics Subject in 5-year Integrated UG-PG Programmes

as per NEP 2020

Curriculum and Credit Framework for 5-year Integrated Programmes (Multiple Entry-Exit, Internships and Choice Based Credit System LOCF)

With effect from the session 2025-26 (in phased manner)

DEPARTMENT OF PHYSICS

Chaudhary Bansi Lal University, Prem Nagar-127021

Bhiwani

HARYANA, INDIA

Chaudhary Bansi Lal University Bhiwani

Scheme of Examination for the Physics Subject in 5-year Integrated Programmes
(Multiple Entry-Exit, Internships and Choice Based Credit System LOCF) with effect from the session 25-26 (in a phased manner)

Semester-I

Course Type	Applicable Scheme	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs.) T+P
MCC-1	C	25IMS-PH-101	Classical Mechanics-I	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
MCC-2	C	25IMS-PH-102	Optics & optical technology	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
CC-M1	C	From available CC-1/MCC-1 of 4 credits as per NEP							
MDC1	C	25IMS-PH-103	Physics Fundamentals -I	2	2	10	40	50	3
			Practicum	1	2	10	10	20	3
AEC-1	C	From Available pool of Ability Enhancement Courses as per NEP							
SEC-1	C	From Available pool of Skill Enhancement Courses as per NEP							
VAC-1	C	From Available pool of Value Added Courses as per NEP							

Semester-II

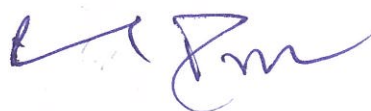
Course Type	Applicable Scheme	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T+P
MCC-3	C	25IMS-PH-201	Electricity and magnetism-I	3	3	20	50	70	3
			Practicum	1	3	10	20	30	3
MCC-42	C	25IMS-PH-202	Classical Mechanics & Waves	3	3	20	50	70	3
			Practicum	1	3	10	20	30	3
CC-M2	C	From available CC-2/MCC-2 of 4 credits as per NEP							
MDC-2	C	25IMS-PH-203	Physics Fundamentals-II	2	2	20	30	50	3
			Practicum	1	2	10	10	20	3
AEC-2	C	From Available pool of Ability Enhancement Courses as per NEP							
SEC-2	C	From Available pool of Skill Enhancement Courses as per NEP							
VAC-2	C	From Available pool of Value Added Courses as per NEP							
Internship	C	25IMS-PH-204	Internship of 4 Credits of 4-6 weeks duration after 2 nd Semester (Mandatory in case of exit)						

Chaudhary Bansi Lal University Bhiwani Undergraduate Programs
Course:CC-1/MCC-1

Max. Marks:100 InternalAssessmentMarks:30 End Term Exam Marks: 70	Time:3hrs
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Session:2025-26			
Part A-Introduction			
Subject	Physics		
Semester	1 st		
Name of the Course	Classical Mechanics-I		
Course Code	25IMS-PH-101		
Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)	CC/MCC		
Level of the course	100-199		
Pre-requisite for the course (if any)	Physics as main subject at level 4 (i.e. 10+2 or equivalent)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the dynamics of system of particles, conservation of energy and momentum application of both translational and rotational dynamics motions simultaneously in analyzing rolling with slipping. 2. Explain and apply Kepler's Laws and Newton's Law of Universal Gravitation to describe planetary motion and orbital dynamics. 3. Evaluate the dynamics of satellites in circular orbits, including geosynchronous satellites, and apply concepts to practical systems like GPS. 4. Learn to present observations, results, analysis and different concepts related to experiments of Mechanics.		
Credits	Theory	Practicum	Total
	3	1	4
Contact Hours	3	2	5

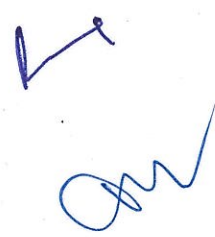
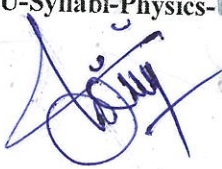




PartB-Contents of the Course

Instructions for Paper-Setter

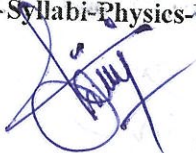
1. Nine questions will be set in total.
2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	Fundamentals of Dynamics: Review of vector algebra and differential calculus of vectors: gradient, divergence and curl. Reference frames. Inertial frames, Review of Newton's Laws of Motion. Concept of inertia (vega) and cause-effect in motion. Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum. Impulse. Momentum of variable-mass system: motion of rocket. Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frames.	11
II	Work and Energy: Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Force as the gradient of potential energy. Work & Potential energy. Elastic potential energy. Law of Conservation of Energy. Spring-mass system without and with friction (Damped oscillations). Energy diagram. Stable and unstable equilibrium. Torque on a dipole	
III	Rotational Dynamics: Angular momentum of a particle and system of particles, Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Theorems of perpendicular and parallel axis (with proof Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation. Rolling motion, condition for pure rolling.	



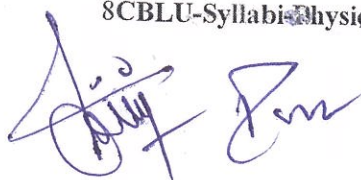
Recommended Books/e-resources/LMS:

1. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
2. Fundamentals-of-Physics-I-Mechanics, R. Shankar, 2014, Yale University Press
3. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
4. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. 2007, Tata McGraw-Hill.
5. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
6. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
7. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
8. University Physics. F. W Sears, M. W Zemansky, H. D Young 13/e, 1986, Addison Wesley
9. Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.
10. Analytical Mechanics, G. R. Fowles and G.L. Cassiday. 2005, Cengage Learning.
11. Feynman Lectures, Vol. I, R. P. Feynman, R. B. Leighton, M. Sands, 2008, Pearson Education.
12. Physics for scientists and Engineers with Modern Phys., J. W. Jewett, R.A. Serway, 2010, Cengage Learning.



Chaudhary Bansi Lal University Bhiwani
Undergraduate Programs
Course:MCC-2

Session:2025-26			
Part A-Introduction			
Subject	Physics		
Semester	1 st		
Name of the Course	Optics & Optical Technology		
CourseCode	25IMS-PH-102		
Course Type: (CC/MCC/MDC/CC-M/DSEC /VOĆ/DSE/PC/AEC/VAC)	MCC		
Level of the course	100-199		
Pre-requisite for the course (if any)	Physics as main subject at level 4 (i.e. 10+2 or equivalent)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Have understanding of Interference - by Division of Wave front, by Division of Amplitude and Interference due to transmitted light & reflected light 2. Understand and explain the diffraction, dispersive power of grating, Rayleigh's criterion and resolving power of telescope & a grating 3. Understand the theories and laws of polarization 4. Understand and appreciate the applications of Lasers in developing LED, Holography, in materials processing, in Medicine, Industry and Military. Have the idea of optical fibers, their properties and principle of propagation of electromagnetic waves through optical fibers		
Credits	Theory	Practicum	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 InternalAssessmentMarks:30 End Term Exam Marks: 70		Time:3 hrs	
PartB-Contents of the Course			




Instructions for Paper-Setter

1. Nine questions will be set in total.
 2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
 3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
 4. 20% numerical problems are to be set.
1. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	Interference by Division of Wave front: Young's double slit experiment, Coherence, Conditions of interference, Fresnel's bi-prism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, phase change on reflection. Interference by Division of Amplitude: Plane parallel thin film, production of colors in thin films, Interference due to transmitted light and reflected light, wedge shaped film (Basic idea), Newton's rings	11
II	Fraunhofer diffraction: Diffraction: a Single Slit, Double Slit and N-slit (Transmission Grating). Rayleigh's criterion of resolution, Resolving Power and Dispersive Power of a Plane Diffraction Grating. Introduction to Fresnel diffraction with examples.	10
III	Polarization: Double refraction: Nicol prism, polaroids and their uses. Production and analysis of plane, circularly and elliptically polarized light, Half-wave and quarter-wave plate, optical activity, Fresnel's explanation of optical activity: Biquartz and half shade polarimeter.	10
IV	Lasers: Coherence (Spatial & Temporal coherence) Stimulated emission, and spontaneous emission, Einstein's 'A' and 'B' coefficients and their relationship amplification. Factor for lasing action: population inversion, active Medium, Pumping and Optical Resonator; Main Properties of laser beam, Gas laser (He-Ne) and Solid state laser (Ruby). Optical fiber: Critical angle of propagation, Acceptance angle Numerical aperture, Mode of Propagation (V-number), Types of optics fiber, Normalized frequency, Attenuation, Applications, Fiber-optic Communication.	14

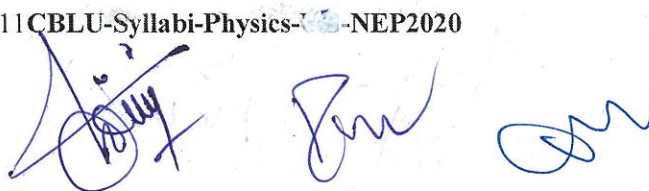
Practicum 1 To determine Refractive index of the material of a prism using sodium source. 2 Determination of wavelength of sodium light using Newton's Rings. 3 To determine the dispersive power and Cauchy constants of the material of a prism using Mercury discharge source. 4 Determination of wavelength of sodium light by using a diffraction grating. 5 Resolving power of a telescope. 6 Resolving power of a grating. 7 Comparison of Illuminating Powers by a Photometer. 8 Measurement of (a) Specific rotation (b) concentration of sugar solution using polarimeter. 9 Ordinary and extraordinary refractive indices for calcite or quartz. 10 To determine the Numerical Aperture and acceptance angle of an Optical Fibre 11 To determine wavelength, coherent length, and coherent time of laser using He-Ne Laser, , 12 Explore acceptance angle and NA by varying core and cladding indices (simulations) 13 Simulate a simple digital communication link using laser and photodiode. Note: Student will perform atleast six experiments. The examiner will allot one Practicum at the time of end term examination.	30
Suggested Evaluation Methods	
Internal Assessment: ➤ Theory(20Marks) • Class Participation: 05Marks • Seminar/presentation/assignment/quiz/classtestetc.:05Marks • Mid-TermExam:10 Marks ➤ Practicum(10Marks) • ClassParticipation:Nil • Seminar/Demonstration/Viva-voce/Labrecordsetc.: 10Marks • Mid-TermExam: Nil	End Term Examination :50Marks 20 Marks
PartC-Learning Resources	





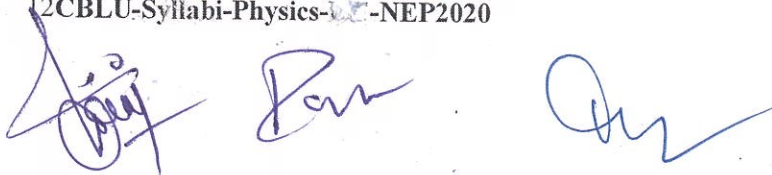

Recommended Books/e-resources/LMS:

- The Physics of Vibrations and Waves, H.J. Pain, 2013, John Wiley and Sons.
1. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
2. Fundamentals and Applications of Ultrasonic Waves, J. David N. Cheeke, CRC (2002)
3. Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
4. An Introduction to Interferometry, John Wiley & Sons, New Delhi
Fundamentals of Photonics, SPIE, Open Source



Chaudhary Bansi Lal University Bhiwani
Undergraduate Programs
Course:MDC-1

Session:2025-26			
PartA-Introduction			
Subject	Physics		
Semester	1 st		
NameoftheCourse	Physics Fundamentals–I		
CourseCode	24UN-PHY-MDC101		
Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)	MDC		
Levelofthecourse(Asper Annexure-I	100-199		
Pre-requisite for the course (if any)	NotstudiedPhysicssubjectatlevel4 (i.e.10+2orequivalent)		
CourseLearningOutcomes(CLO):	After completingthiscourse,thelearnerwillbeableto: ' 1. Haveknowledgeaboutthenature,scopeandimpactof physics on technological development of the society. 2. Understandanddescribemotionofanobjectinonedimension. 3. Understandanddescribethelawsofmotionandtheir applications in daily life. 4. Understandandappreciatetheimportanceoflawsof conservation of energy and momentum in daily life. 5. Learn to present observations, results, analysis and different concepts related to experiments of Physics Fundamentals –I		
Credits	Theory	Practicum	Total
	2	1	3
ContactHours	2	2	4
Max. Marks:70 InternalAssessmentMarks:20 End Term Exam Marks: 50		Time:3hrs	
PartB-ContentsoftheCourse			



Instructions for Paper-Setter

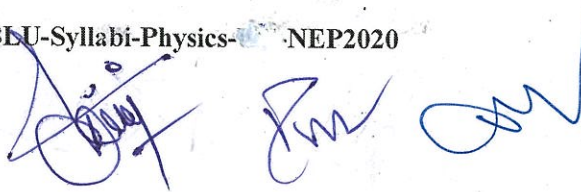
1. Nine questions will be set in total.
2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
1. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	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 caliper, Screw Gauge	8
II	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.	8
III	Causes of motion- concept of force, Newton's 1st law of motion, inertia and mass; Newton's 2 nd law of motion, momentum and force; 3 rd 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.	7
IV	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 center of mass-Physics behind cycling, rock climbing and skating.	7

	<u>Practicum</u> 1. To measure the diameter of a small spherical/ cylindrical body. 2. To measure the length, width and height of the given rectangular block.	30
	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: Student will perform at least six experiments. The examiner will allot one Practicum at the time of end term examination.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory (15 Marks) • Class Participation: 04 Marks • Seminar/presentation/assignment/quiz/class test etc.: 04 Marks • Mid-Term Exam: 7 Marks ➤ Practicum (5 Marks) • Class Participation: Nil • Seminar/Demonstration/Viva-voce/Lab records etc.: 05 Marks • Mid-Term Exam: Nil	End Term Examination : 35 Marks : 15 Marks	
Part C - Learning Resources		

Recommended Books/e-resources/LMS:

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 Practicum Physics, C.L. Arora, R Chand & Co. New Delhi
7. B.Sc Practicum Physics, Harnam Singh and Dr. P.S. Hemne, S Chand & Company Ltd.



Chaudhary Bansi Lal University
Bhiwani Undergraduate Programs
Course:CC-2/MCC-3

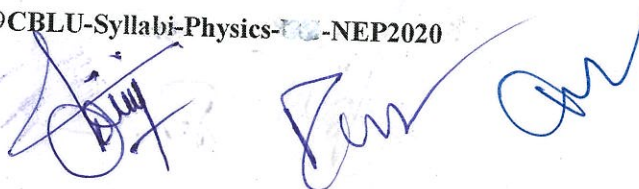
Session:2025-26	
Part A-Introduction	
Subject	Physics
Semester	2 nd
Name of the Course	Electricity and Magnetism-I
CourseCode	25IMS-PH-201
Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)	CC/MCC
Level of the course(As per Annexure-I)	100-199
Pre-requisite for the course (if any)	Appeared or passed the 1 st sem(B.Sc. Physical Science/ equivalent)
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Explain and differentiate the vector and scalar formalisms of electrostatics. Also be able to apply Gauss's Divergence & Stokes theorem to solve various problems in electrostatics 2. Describe the magnetic materials & important properties of magnetic field. Understand the properties and theories of dia-, para- & ferromagnetic materials. 3. Derive Maxwell equations and their physical significance and familiar about the propagation of electromagnetic waves i.e. boundary conditions at the interface between different media. The students will also be able to have basic idea about the propagation of electromagnetic waves in free space and in medium. 4. Understand D.C. and A.C. circuits, able to apply and analyze using networks. Analyze DC/AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor. 5. Learn to present observations, results, analysis and different concepts related to experiments of Electricity and Magnetism.



Credits	Theory	Practicum	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 InternalAssessmentMarks:30 End Term Exam Marks: 70		Time:3hrs	
PartB-Contents of the Course			
<u>Instructions for Paper-Setter</u>			
1. Nine questions will be set in total. 2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No. 3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks. 4. 20% numerical problems are to be set. 1. Use of scientific (non-programmable) calculator is allowed.			
Unit	Topics	Contact Hours	
I	Vector background and electric field: Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem.	11	
II	Electrostatics: Superposition principle for continuous charge distribution, Gauss's law in integral and differential form, electric potential, energy of electrostatic field, Poisson's and Laplace's equations (introduction only), properties of conductors, method of images (with simple example Dielectric medium, Polarization, Bound charges in a polarized dielectric and their physical interpretation.	12	
III	Magnetostatics: Lorentz force, Ampere's and Biot-Savart's law, divergence and curl of B , vector potential, charged particle in electromagnetic field (with example); Magnetism in matter: volume and surface currents (introduction only), magnetization vector M and vector H . Magnetic properties Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B , H , M , Para-, Dia- and Ferromagnetism, B-H curve and hysteresis	12	

Recommended Books/e-resources/LMS:

1. Electricity and Magnetism (Berkley, Phys. Course 2), Edward M. Purcell, 1986 McGraw- Hill Education
2. Electricity and Magnetism: A.S. Mahajan & A.A. Rangwala (Tata-McGrawHill), 1988.
3. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
4. Classical Electrodynamics, J.D. Jackson, John Wiley & Sons
5. Feynman Lectures Vol. 2, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education
6. Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
7. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
8. B.Sc. Practicum Physics, C.L. Arora, S. Chand Publisher, New Delhi
9. Advanced Level Practicum Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
10. Practicum Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
11. Practicum Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut
12. Modern Approach to Practicum Physics, R.K. Singla, Modern Publishers, Jalandhar
13. Advanced Practicum Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House



Chaudhary Bansi Lal University Bhiwani
Undergraduate Programs
Course:CC-M2

Session:2025-26			
Part A-Introduction			
Subject	Physics		
Semester	2 nd		
Name of the Course	Classical Mechanics & Waves		
Course Code	25IMS-PH-202		
Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)	CC/MCC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	Appeared or passed the 1 st sem(B.Sc. Physical Science/ equivalent)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Explain and differentiate the vector and scalar formalisms of electrostatics. Also be able to apply Gauss's Divergence & Stokes theorem to solve various problems in electrostatics 2. Describe the magnetic materials & important properties of magnetic field. Understand the properties and theories of dia-, para- & ferromagnetic materials 3. Derive Maxwell equations and their physical significance and familiar boundary conditions at the interface between different media. The students will also be able to have basic idea about the propagation of electromagnetic waves 4. Analyze DC/AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor 5. Learn to present observations, results, analysis and different concepts related to experiments of Electricity and Magnetism 5. Differentiate between elastic and plastic body. Elastic constants, determination and their physical significance. Torque and its significance.		
Credits	Theory	Practicum	Total

	1	1	2
Contact Hours	1	2	3
Max. Marks:50 Internal Assessment Marks:15 End Term Exam Marks: 35		Time:3hrs	

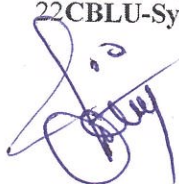
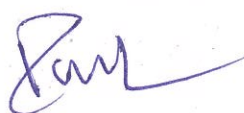
Part B-Contents of the Course

Instructions for Paper-Setter

1. Nine questions will be set in total.
2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	Central Force: Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution. The energy equation and energy diagram., compound pendulum or physical pendulum in form of elliptical lamina and expression of time period, determination of g by means of bar pendulum, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (m) joined together with spring of spring constant (k)	10
II	Simple Harmonic Oscillations SHM: Differential equation of SHM and its solution, Simple pendulum and compound pendulum, Superposition of Collinear Harmonic oscillations: Linearity and Superposition Principle, Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies Beats (Introduction only); Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical Methods, Lissajous Figures Damped Harmonic Oscillations: Damped motion of mechanical and electrical oscillators, critical damping, amplitude decay, energy decay, logarithmic decrement, relaxation time, Q -value. Forced Harmonic Oscillations: Transient and steady state behavior of a forced oscillator, Q -Value- as a measure of power absorption band width, Coupled Oscillation (basic concept only).	15
III	Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems. Special Theory of Relativity: Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities.	10

	variation of mass-energy equivalence.	
IV	Wave Motion: Wave Equation, Solution of wave equation, Plane and Spherical Waves, Longitudinal and Transverse Waves, Particle and Wave Velocities, The string as a force oscillator, Velocity of Transverse vibrations of Stretched Strings, Reflections and transmission of waves on a string at a boundary, Velocity of Longitudinal Waves in a Fluid in a Pipe, Newton's Formula for Velocity of Sound, Reflections and transmission of sound waves at a boundary, Energy distribution in sound waves, Phase and Group Velocities.	10
	Practicum 1.To determine the value of g using Bar Pendulum. 2.To determine the value of g using Kater's Pendulum. 3.To obtain and analyze Lissajous figures by applying two perpendicular SHMs. 4.To study damped oscillations in an LCR circuit. 5.Visualize beats patterns from two waves of slightly different frequencies (simulation). 6.To observe and measure the velocity of transverse waves on a stretched string. 7.To determine the velocity of sound in air using a resonance tube. 8.To determine the velocity of longitudinal waves in a metal rod. 9.To differentiate and estimate phase and group velocities (simulation/Instrument). 10. Plot $A(t)=A_0e^{-\gamma t}$, vary damping constant and initial amplitude, plot decay curves (simulations). 11. Observe transverse wave propagation on a string and study the wave equation (Simulation: adjust tension, mass, frequency): $\partial^2 y / \partial t^2 = v^2 \partial^2 y / \partial x^2$ 12. Explore how sound propagates in open/closed pipes. Simulate different pipe lengths and note resonant frequencies. 13. To determine the wavelength of sodium light by Michelson Interferometer 14. To study (i) Length contraction (ii) Time dilation (iii) Velocity addition by using simulations (any two)	30
	Note: Student will perform atleast six experiments. The examiner will allot one Practicum at the time of end term examination.	
SuggestedEvaluationMethods		


Pre-requisite for the course (if any)	NotstudiedPhysicssubjectatlevel4 (i.e.10+2orequivalent)		
CourseLearningOutcomes(CLO):	After completing this course, the learner will be able to: 1. Have basic knowledge about nature of light, the associated phenomena and their importance in daily life 2. Understand and describe the working of important optical instruments through the learning of image formation by mirrors and lenses 3. Have basic knowledge about electric current, electric circuit, electric components, and Practicum utility of heating and magnetic effects of electric current 4. Grasp an introductory idea about the generation of X-rays, α-, β- and γ-rays through an understanding of composition of atom & nucleus 5. Understand the observations, results, analysis and different concepts related to experiments of light &optics.		
Credits	Theory	Practicum	Total
	2	1	3
ContactHours	2	2	4
Max. Marks:75 InternalAssessmentMarks:20 End Term Exam Marks: 55		Time:3hrs	
PartB-ContentsoftheCourse			
<u>InstructionsforPaper-Setter</u> 1.Nine questions will be set in total. 2. Question no. 1will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No. 3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks. 4. 20%numericalproblemsareto beset. 5. Use of scientific(non-programmable) calculator is allowed.			
Unit	Topics		Contact Hours

I	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	7
II	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	8
III	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 Ohm's law, electric potential and potential difference, emf; Electric circuit- resistor, capacitor, battery, ammeter and voltmeter; Series and parallel combinations of resistors, 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 Practicum 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.	8
IV	Structure of an atom- Rutherford's model of an atom, Bohr's model of an atom and composition of the atom-electron, proton and neutron, orbits or shells (energy levels in an atom), distribution of electrons in different shells of the atom, atomic number and atomic mass of an atom, core shell and outer shell, valency of an atom, excitation and ionization of the atom, meaning of atomic transitions; Discovery of X-rays, Generation of X-rays, their characteristics, applications and harmful effects; Composition of nucleus, meaning of nuclear transitions and properties of α-, β- and γ-rays	7

Recommended Books/e-resources/LMS:

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.
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.

