Chaudhary Bansi Lal University

(AStateUniversityestablishedunderHaryanaActNo.25of2014)

Scheme of Examination
for
Physics Subject
in
5-year Integrated B.Sc. (Hons./Hons. with research) (Physics)-M.Sc. (Physics)

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-127031
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	From Available pool of Multidisciplinary Courses as per NEP/SWAYAM/MOOCs							
AEC-1	C	From Available pool of Ability Enhancement Courses as per NEP/SWAYAM/MOOCs							
SEC-1	C	From Available pool of Skill Enhancement Courses as per NEP/SWAYAM/MOOCs							
VAC-1	C	From Available pool of Value Added Courses as per NEP/SWAYAM/MOOCs							

Semester-II

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

Max. Marks:100 **InternalAssessmentMarks:30** **End Term Exam Marks: 70**	**Time:3 Hrs.**

Session:2025-26			
Part A-Introduction			
Subject	Physics		
Semester	1st		
Nameof the Course	Classical Mechanics-I		
CourseCode	25IMS-PH-101		
Course Type: (CC/MCC/MDC/CCM/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

Part B-Contents of the Course

Instructions for Paper-Setter

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	**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.	12
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.	10
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.	12
IV	**Gravitation (Central Force):** Kepler's Laws. Law of gravitation. Planetary motion from Surya Siddhanta. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). Physiological effects on astronauts.	11

	Practicum 1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in observations. 3. To determine the height of a building using a Sextant. 4. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity. 5. To determine the Moment of Inertia of a Flywheel. 6. To determine g and velocity for a freely falling body using Digital timing Technique. 7. To explore elliptical orbits and verify Kepler's laws (software or an online simulation). 8. To track positions, calculate distances, and discuss triangulation (Use smart phones or handheld GPS devices). 9. To Study motion of a sphere, cylinder, and hoop rolling down a ramp (Simulation). 10. Distinguish between pure rolling, slipping, and combined motion (simulations)**.** 11. Simulate a physical pendulum and determine its period and moment of inertia. 12. To determine the moment of inertia of an irregular-shaped body using the concept of a physical pendulum. **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 (10 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam:**Nil**	**End Term Examination :50Marks** **:20Marks**

PartC- Learning Resources

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

<table>
<tr><th colspan="4">Session:2025-26</th></tr>
<tr><th colspan="4">Part A-Introduction</th></tr>
<tr><td>Subject</td><td colspan="3">Physics</td></tr>
<tr><td>Semester</td><td colspan="3">1st</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Optics & Optical Technology</td></tr>
<tr><td>Course Code</td><td colspan="3">25IMS-PH-102</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)</td><td colspan="3">MCC</td></tr>
<tr><td>Level of the course</td><td colspan="3">100-199</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Physics as main subject at level 4 (i.e. 10+2 or equivalent)</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="3">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.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practicum</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td colspan="2">Max. Marks:100
InternalAssessmentMarks:30
End Term Exam Marks: 70</td><td colspan="2">Time: 03 Hrs.</td></tr>
<tr><th colspan="4">Part B-Contents of the Course</th></tr>
</table>

Instructions for Paper-Setter

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% numerical problems are to be set.
5. 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'sRings. 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 andNA 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)** • Class Participation : **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **10Marks** • Mid-Term Exam : **Nil**		**End Term Examination :50Marks** **20 Marks**
PartC-Learning Resources		
Recommended Books/e-resources/LMS: 1. The Physics of Vibrations and Waves,H.J.Pain,2013,John Wiley and Sons. 2. The Physics of Waves and Oscillations, N.K.Bajaj,1998,Tata McGraw Hill. 3. Fundamentals and Applications of Ultrasonic Waves, J. David N.Cheeke, CRC(2002). 4. Optics, Ajoy Ghatak,2008, Tata McGraw Hill. 5. An Introduction to Interferometery, John Wiley & Sons, New Delhi. 6. Fundamentals of Photonics, SPIE, Open Source.		

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

<table>
<tr><td colspan="4">Session:2025-26</td></tr>
<tr><td colspan="4">PartA-Introduction</td></tr>
<tr><td>Subject</td><td colspan="3">Physics</td></tr>
<tr><td>Semester</td><td colspan="3">1st</td></tr>
<tr><td>NameoftheCourse</td><td colspan="3">Physics Fundamentals-I</td></tr>
<tr><td>CourseCode</td><td colspan="3">24UN-PHY-MDC101</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC /VOC/DSE/PC/AEC/VAC)</td><td colspan="3">MDC</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">100-199</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Not studied Physics subject at level 4 (i.e.10+2orequivalent)</td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Have knowledge about the nature, scope and impact of physics on technological development of the society.
2. Understand and describe motion of an object in one dimension.
3. Understand and describe the laws of motion and their applications in daily life.
4. Understand and appreciate the importance of laws of 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.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practicum</td><td>Total</td></tr>
<tr><td>2</td><td>1</td><td>3</td></tr>
<tr><td>Contact Hours</td><td>2</td><td>2</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:70
InternalAssessmentMarks:20 End Term Exam Marks: 50</td><td colspan="2">Time:3 Hrs</td></tr>
<tr><td colspan="4">PartB – ContentsoftheCourse</td></tr>
</table>

InstructionsforPaper-Setter

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% numerical problems are to beset.
5. 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.	08
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.	08
III	Causes of motion concept of force, Newton's 1st law of motion, inertia and mass; Newton's 2nd law of motion, momentum and force; 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.	07
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.	07

	Practicum 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 down ward 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 θ. 7. To find the weight of a given body using parallelogram law of vectors. 8. Verification of Archimedes principle. 9. Verification of Work-energytheorem. 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.**	30

Suggested Evaluation Methods	
Internal Assessment: ➢ **Theory(15Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/classtestetc.:**04 Marks** • Mid-Term Exam: 0**7 Marks** ➢ **Practicum(05Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.:**05Marks** • Mid-Term Exam: **Nil**	**End Term Examination :35Marks** **:15Marks**

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, NewDelhi, India.
3. Modern Physics (2nd edition),byS.L.Kakani and Shubhra Kakani,VivaBooks,NewDelhi.
4. Physics for Scientists and Engineers with Modern Physics, 7th edition, by Raymond A. Serway and JohnW. Jewett, Jr., Thomson Higher Education10DavisDriveBelmont, CA 94002-3098 USA.
5. Physics For You, Fifth Edition, by Keith Johnson, OUP Oxford;5th edition (23June 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.