SMRJ Government College, Siwani (Bhiwani)

(Affiliated to Chaudhary Bansi Lal University, Bhiwani)

Session: 2025-26

Lesson Plan

(Department of Physics)

Teacher: Parveen Kumar	**Course Type & Title: CC-1/MCC-1 (Mechanics & Practicum)**
Class: B.Sc. (NM)- Ist year	**Course Code: 24UN-PHY-101**
Semester: Ist	**Credits: 3+1**
Maximum Marks: 100	**Internal Assessment Marks: 30**
End Term Exam Marks: 70	**Practical Marks: 30**

Course Outcomes: 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 analysing rolling with slipping.
2. Differentiate between elastic and plastic body. Elastic constants, determination and their physical significance. Torque and its significance.
3. Familiar about the special theory of relativity and its applications. Michelson's Morley experiments and its finding.
4. Analyse the two body Central Force problem and its applications
5. Learn to present observations, results, analysis and different concepts related to experiments of Mechanics.

Sr. No.	Week/Month, 2025	Unit/ Topic/ Chapter to be covered	Assignment/ Test/ Remarks, if any
1	01.08.2025 – 02.08.2025	Rigid body, Moment of Inertia, Radius of Gyration, Torque, Rotational Kinetic Energy, Angular momentum	
2	04.08.2025 – 09.08.2025	Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, Solid sphere	
3	11.08.2025 – 16.08.2025	Hollow sphere, rectangular plate, square plate, Solid cone, Triangular plate, Law of conservation of angular momentum, Rolling motion	
4	18.08.2025 – 23.08.2025	condition for pure rolling, acceleration of body rolling down an inclined plane, Fly wheel, Moment of Inertia of an irregular body	
5	25.08.2025 – 30.08.2025	Elasticity, Deforming force, Elastic limit, stress, strain	

		and their types, Hooke's law, Modulus of rigidity, Relation between shear angle and angle of twist, elastic energy stored/volume in an elastic body	
6	01.09.2025 – 06.09.2025	Elongation produced in heavy rod due to its own weight and elastic potential energy stored in it, Tension in rotating rod, Poisson's ratio and its limiting value, Elastic Constants and their relations. Torque required for twisting cylinder; Hollow shaft is stiffer than solid one.	
7	08.09.2025 – 13.09.2025	Bending of beam, bending moment and its magnitude, Flexural rigidity, Geometrical moment of inertia for beam of rectangular cross-section and circular cross-section. Bending of cantilever (loaded by a weight W at its free end)	
8	15.09.2025 – 20.09.2025	weight of cantilever uniformly distributed over its entire length. Dispersion of a centrally loaded beam supported at its ends, determination of elastic constants for material of wire by Searle's method.	Test and Assignment
9	22.09.2025 – 27.09.2025	Special Theory of Relativity: Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations,	
10	29.09.2025 – 04.10.2025	Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity.	
11	06.10.2025 – 11.10.2025	relativistic addition of velocities, variation of mass-energy equivalence, relativistic Doppler effect, relativistic kinematics	
12	13.10.2025 – 18.10.2025	transformation of energy and momentum, transformation of force, Problems of relativistic dynamics.	
13	27.10.2025 – 01.11.2025	Gravitation and central force motion: Law of gravitation, Potential and Field due to spherical shell and solid sphere. Motion of a particle under central force field	
14	03.11.2025 – 08.11.2025	Two body problem and its reduction to one body problem and its solution, compound pendulum or physical pendulum in form of elliptical lamina and expression of time period	**Mid Term Exam**
15	10.11.2025 – 15.11.2025	determination of g by means of bar pendulum, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system,	Assignment

	17.11.2025 – 22.11.2025	possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (mojoined together with spring of spring constant (k).	Test
17	24.11.2025 – 29.11.2025	Revision	

Recommended Books/ E resources/ LMS:

1. Mechanics, S.K. Gupta, Rajesh Arora, R.Chand & Co, New Delhi,2024
2. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
3. Elements of Properties of Matter, D.S.Mathur,S.Chand&Com.Pt.Ltd.,NewDelhi
4. Physics for scientists and Engineers with Modern Phys.,J.W.Jewett,R.A.Serway,2010, Cengage Learning
5. An introduction to mechanics, D. Kleppner, R.J. Kolenkow,1973, McGraw-Hill.
6. Classical Mechanics, J.C.Upadhyaya, HimalayaPublishingHouse.
7. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi
8. Practical Physics, S.S.Srivastavaand M.K.Gupta,AtmaRam&Sons,Delhi
9. Practical Physics, S.L.Gupta and V.Kumar, Pragati Prakashan Meerut
10. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar

Signature of the teacher concerned

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Session: 2025-26

Lesson Plan

(Department of Physics)

Teacher: Parveen Kumar	**Course Type & Title: CC-M1 (Elementary Mechanics & Practicum)**
Class: B.Sc. (LS)- Ist year	**Course Code: 24UN-PHY-103 (Minor)**
Semester: Ist	**Credits: 1+1**
Maximum Marks: 50	**Internal Assessment Marks: 10+5**
End Term Exam Marks: 20	**Practical Marks: 15**

Course Outcomes: After completing this course, the learner will be able to:

1. Understand the dynamics of system of particles, Determination of moment of inertia using Theorems of parallel and perpendicular axis.Application of both translational and rotational dynamics motions simultaneously in analyzing rolling with slipping
2. Differentiate between elastic and plastic bodies. Elastic constants, determination and their physical significance. Torque and its significance in rotatory motion
3. Familiar about the special theory of relativity and its applications. Michelson's Morley experiment and its findings.
4. Analyze the two body Central Force problem and its applications
5. Learn to present observations, results, analysis and different concepts related to experiments of Mechanics

Sr. No.	Week/Month, 2025	Unit/ Topic/ Chapter to be covered	Assignment/ Test/ Remarks, if any
1	01.08.2025 – 02.08.2025	**Fundamentals of Dynamics**: Rigid body, Moment of Inertia, Radius of Gyration,	
2	04.08.2025 – 09.08.2025	Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc,	
3	11.08.2025 – 16.08.2025	Disc, Angular Disc, Solid cylinder	
4	18.08.2025 – 23.08.2025	**Elasticity:** Deforming force, Elastic limit, stress, strain and their types	
5	25.08.2025 – 30.08.2025	Hooks law, Module of elasticity	
6	01.09.2025 – 06.09.2025	Relation between shear angle and angle of twist, Poisson's ratio and its limiting value.	
7	08.09.2025 – 13.09.2025	Torque required for twisting cylinder.	

8	15.09.2025 – 20.09.2025	**Special Theory of Relativity:** Michelson's Morley experiment and its outcomes	Test and Assignment
9	22.09.2025 – 27.09.2025	Postulates of special theory of relativity, Lorentz Transformations,	
10	29.09.2025 – 04.10.2025	Lorentz contraction, Time dilation, Relativistic transformation of velocity,	
11	06.10.2025 – 11.10.2025	relativistic addition of velocities, variation of mass-energy equivalence	
12	13.10.2025 – 18.10.2025	**Gravitation and central force motion:** Law of gravitation, Potential and field due to spherical shell and solid sphere.	
13	27.10.2025 – 01.11.2025	Motion of a particle under central force field, Normal coordinates and normal modes,	
14	03.11.2025 – 08.11.2025	**Mid Term Exam**	**Mid Term Exam**
15	10.11.2025 – 15.11.2025	Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation oftwo identical simple pendulums of length (l)	Assignment
16	17.11.2025 – 22.11.2025	possible angular frequencies of oscillation of small bob of mass (m0 joined together with spring of spring constant (k).	
17	24.11.2025 – 29.11.2025	Revision	

Recommended Books/ E resources/ LMS:

1. Mechanics "Berkeley Physics Course Vol. I", Charles Kittel, Tata McGraw-Hill
2. Mechanics, D.S. Mathur, S. Chandand Company Limited, 2000
3. Elements of Properties of Matter, D.S. Mathur, S. Chand & Com. Pt. Ltd., New Delhi
4. Physics, Resnick, Halliday &Walker, Wiley
5. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
6. Properties of Matter, R. Murgeshan, S. Chand & Com. Pt. Ltd., New Delhi
7. Classical Mechanics, J.C. Upadhyaya, Himalaya Publishing House
8. Advanced Level Practicum Physics, M. Nelkon and Ogborn, Henemann Education Books
9. Ltd., New Delhi
10. Practicum Physics, S.L. Gupta and V.Kumar, Pragati Prakashan Meerut
11. Modern Approach to Practicum Physics, R.K. Singla, Modern Publishers, Jalandhar

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Session: 2025-26

Lesson Plan

(Department of Physics)

Teacher: Parveen Kumar	**Course Type & Title: CC-3/MCC-4 (Thermodynamics& Statistical Physics & Practicum)**
Class: B.Sc. (PS & LS)- 2nd year	**Course Code: 24UN-PHY-301**
Semester: 3rd	**Credits: 3+1**
Maximum Marks: 100	**Internal Assessment Marks: 30**
End Term Exam Marks: 70	**Practical Marks: 30**

Course Outcomes: After completing this course, the learner will be able to:

1. Understand and describe the basic concepts and laws of thermodynamics
2. Apply the laws of thermodynamics to develop Maxwell's thermodynamic relations be able to understand their physical interpretations
3. Appreciate cellular nature of phase space and have better knowledge of classical statistics which would result in greater insight into solutions of various complex problems
4. Have better understanding of quantum statistics and are in a position to extend the treatment to the analysis of complex problems
5. Learn to present observations, results, analysis and different concepts of experiments related to Thermodynamics & Statistical Physics

Sr. No.	Week/Month, 2025	Unit/ Topic/ Chapter to be covered	Assignment/ Test/ Remarks, if any
1	01.08.2025 – 02.08.2025	Thermodynamic-systems, variables and equation of state, thermal equilibrium, Zeroth law of thermodynamics; Concept of heat and work, First law of thermodynamics-its significance and limitations,	
2	04.08.2025 – 09.08.2025	Internal energy as a state function, Different types of process-isochoric process, isobaric process, adiabatic process, isothermal process, cyclic process,	
3	11.08.2025 – 16.08.2025	Reversible and irreversible process, First law and cyclic process; Second law of thermodynamics and its significance, Carnot theorem;	
4	18.08.2025 – 23.08.2025	Joule's free expansion, Joule Thomson effect, Joule-Thomson (Porous plug) experiment: conclusions and explanation, Entropy,	
5	25.08.2025 – 30.08.2025	Calculations of entropy of reversible and irreversible process, T-S diagram, entropy of a perfect gas, Nernst heat law (third law of thermodynamics); Liquefaction of gases	

		(qualitative idea).	
6	01.09.2025 – 06.09.2025	Derivation of Clausius-Clapeyron and Clausius latent heat equations and their significance, phase diagram and triple point of a substance, development of Maxwell thermodynamical relations,	
7	08.09.2025 – 13.09.2025	Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, Derivation of Maxwell thermodynamical relations from thermodynamical functions,	
8	15.09.2025 – 20.09.2025	Application of Maxwell relations: relations between two specific heats of gas, derivation of Stefan's law, Adiabatic compression and expansion of gas & deduction of theory of Joule,	Test and Assignment
9	22.09.2025 – 27.09.2025	Thomson effect. Distribution of N (for N= 2, 3, 4) distinguishable and indistinguishable particles in two boxes of equal size, Microstates and macrostates, thermodynamical probability,	
10	29.09.2025 – 04.10.2025	Constraints and accessible states, statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, β-parameter, entropy and probability;	
11	06.10.2025 – 11.10.2025	Concept of phase space, division of phase space into cells, postulates of statistical mechanics; Classical and quantum statistics, law, Basic approach to these statistics,	
12	13.10.2025 – 18.10.2025	Maxwell-Boltzmann statistics applied to an ideal gas in equilibrium-energy distribution, Maxwell's distribution of speed & velocity (derivation required), Most probable speed, average and r.m.s. speed;	
13	27.10.2025 – 01.11.2025	Mean energy for Maxwellian distribution. Dulong and Petit Law, derivation of Dulong and Petit law from classical physics Need of Quantum statistics- classical versus quantum statistics,	
14	03.11.2025 – 08.11.2025	Bose-Einstein energy distribution Law, Application of B. E. Statistics to Planck's radiation law, degeneracy and B. E. condensation;	**Mid Term Exam**
15	10.11.2025 – 15.11.2025	Fermi-Dirac energy distribution Law, F.D. gas and degeneracy, Fermi energy and Fermi temperature; F. D. energy distribution Law for electron gas in metals	Assignment
16	17.11.2025 – 22.11.2025	Fermi energy and Fermi temperature; F. D. energy distribution Law for electron gas in metals, zero point energy, average speed (at 0 K) of electron gas	Test
17	24.11.2025 – 29.11.2025	Revision	

Recommended Books/ E resources/ LMS:

1. Thermal Physics and Statistical Mechanics, S.K. Roy, New Age International Publishers, New Delhi
2. Thermodynamics and Statistical Physics, J.K. Sharma and K.K. Sarkar, Himalaya Publishing House, Bombay
3. Introduction to Thermodynamics and its Applications, Stowe Keith, University Press (India) Pvt. Ltd, Hyderabad
4. Introductory Thermodynamics, Pierre Infelta, Brown Walker Press, Boca Ratan, Florida
5. Fundamentals of Thermodynamics, J.K.Johnson, University of Pittsburgh 2009
6. Thermodynamics and Its Applications, Jefferson Tester, MichaelModell,3rdEdition
7. Thermodynamics, Statistical Thermodynamics & Kinetics, Thomas Engel, PhilipReid,2ndEdition
8. Advanced Practical Physics for students, B.L.Flint &H.T. Worsnop,1971, Asia Publishing House.
9. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn,4thEdition, reprinted 1985, Heinemann Educational Publishers
10. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11thEdition, 2011, Kitab Mahal, New Delhi.
11. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.

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Session: 2025-26

Lesson Plan

(Department of Physics)

Teacher: Parveen Kumar
Class: B.Sc. (NM)- 3rd year
Semester: 5th
Maximum Marks: 100
End Term Exam Marks: 40+40=80

Course Type & Title: Solid State Physics & Statistical Physics
Course Code: 20UPHY-501A & 20UPHY-502A
Credits: 2+2
Internal Assessment Marks: 20

Sr. No.	Week/Month, 2024	Unit/ Topic/ Chapter to be covered	Assignment/ Test/ Remarks, if any
1	01.08.2025 – 02.08.2025	Crystal Structure: Crystalline and amorphous solids, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes	
2	04.08.2025 – 09.08.2025	unit cell and primitive Cell, Winger Seitz primitive Cell, symmetry operations for a two-dimensional crystal, Bravais lattices in two and three dimensions,	
3	11.08.2025 – 16.08.2025	Crystal planes and Miller indices, Crystal structures of Sodium Chloride and Diamond, Crystal Structure: X-ray diffraction,	
4	18.08.2025 – 23.08.2025	Bragg's Law and experimental X-ray diffraction methods, K-space and reciprocal lattice and its physical significance, Reciprocal lattice vectors,	Test
5	25.08.2025 – 30.08.2025	reciprocal lattice to a simple cubic lattice, BCC and FCC. Free electron theory: Free electron gas models and its failures, Sommerfeld quantum theory,	
6	01.09.2025 – 06.09.2025	Hall Effect, Lattice vibrations: lattice vibration and concept of phonon, Specific heat of solids, Dulong and Petit's Law,	
7	08.09.2025 – 13.09.2025	Einstein and Debye theories of specific heat of solids. Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevin Theory of dia — and Paramagnetic Domains,	
8	15.09.2025 – 20.09.2025	Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Super conductivity: Historical introduction,	Assignment
9	22.09.2025 – 27.09.2025	survey of superconductivity, super conducting systems. **Statistical Physics**: Probability, some probability considerations, basic idea of Permutations and Combinations,	
10	29.09.2025 – 04.10.2025	Combinations possessing maximum probability, combinations possessing minimum probability, Distribution	

		of molecules in two boxes. Case with weightage (general).	
11	06.10.2025 – 11.10.2025	Phase space, microstates and microstates, Statistical fluctuations constraints and accessible States, Entropy and Thermodynamic probability	
12	13.10.2025 – 18.10.2025	. Concept of Ensembles and type of Ensembles. Postulates of Statistical Physics, Phase space and Application to One Dimension Harmonic Oscillator and Free particle, ,	
13	27.10.2025 – 01.11.2025	Division of phase space into cells, Basic approach in three statistics, Maxwell-Boltzmann Distribution Law, Thermodynamic Functions of an Ideal Gas, Classical Entropy Expression, Gibbs Paradox.	
14	03.11.2025 – 08.11.2025	Condition of equilibrium between two systems in thermal contact. Entropy and Probability, Bose-Einstein statistics, Thermodynamic relations of a Completely Degenerate Bose Gas.	
15	10.11.2025 – 15.11.2025	Bose-Einstein condensation, liquid He (qualitative description), Thermodynamic relations of a Completely Degenerate Fermi gas. photon gas,	Assignment
16	17.11.2025 – 22.11.2025	Application of B.E. Statistics to Planck's radiation law, Fermi-Dirac statistics, Fermi Energy, Electron gas in a Metal, Zero-point energy,	Test
17	24.11.2025 – 29.11.2025	Specific Heat of Metals, Thermionic emission, White Dwarf Stars, Chandrasekhar Mass Limit, Comparison of three statistics M-B, B-E and F-D	

Recommended Books/ E resources/ LMS:

1. Introduction to Solid State Physics, Charles Kittel, 8th Edition, 2004, Wiley India Pvt. Ltd.
2. Elements of Solid-State Physics, J.P. Srivastava, 4th Edition, 2015, Prentice-Hall of India.
3. Solid State Physics by R.K. Puri and V.K. Babbar, S. Chand Publication.
4. Introduction to Statistical Mechanics, B.B. Laud, Macmillan 1981
5. Statistical Physics, Berkeley Physics Course Volume 5 by F Reif (Tata McGraw-Hill Company Ltd, 2008)
6. Statistical and Thermal Physics: an introduction by S.Lokanathan and R.S.Gambhir. (P.H.I., 1991).
7. Statistical Mechanics by R. K. Patharia. (Oxford: Butterworth, 1996).
8. J.K. Sharma and K.K. Sarkar, Thermodynamics and statistical Physics, Himalaya Publishing House (1991, Bombay.)

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