Course Title:	**Foundations of Modern Physics**
Course Code:	**PHL MD208**
Course Coordinator	**Dr. Ram Prakash**
Credits	**4**

Evaluation Scheme Total 100 Marks

Quiz (Total 20 Marks)				Assignment/Project (Total 20 marks) (Minimum Two Assignments or one Project)		Mid-Term	Major Examination	Total
Quiz I (5 marks	Quiz II (5 marks)	Quiz III (5 marks)	Quiz IV (5 marks)			20 marks) (1 ½ Hour Duration)	(40 marks) (3 Hour Duration	100 Marks

WEEKS	TOPICS TO BE COVERED
Week 1	Special Theory of Relativity: Postulates – Lorenz transformations – Time dilation – Length contraction
Week 2	Doppler effect – Twin paradox – velocity addition – relativistic momentum Mass energy equivalence.
Week 3	Electricity and Magnetism in relativity – Introduction to general relativity
Week 4	EM waves – Black body radiation – Photoelectric effect – X-rays – Diffraction of x-rays
Week 5	– Compton effect – de Broglie waves – Phase and group velocities – Electron diffraction – Uncertainty principle.
Week 6	Quantum mechanics**:** Wave equation – Schrödinger equation –
Week 7	Operators – Postulates of quantum mechanics –
Week 8	Particle in a box – Finite potential well
Week 9	Introduction to quantum tunneling – Harmonic oscillator
Week 10	Hydrogen atom: Schrödinger equation – Separation of variable – Quantum numbers – Quantization of energy
Week 11 (17th -21st March, 2025)	**Mid-Term**
2nd April, 2025	**Showing of Mid-Term Answer Sheets**
Week 13	Angular momentum – Electron Probability density, Radiative transitions, Selection Rules, Zeeman effect
Week 14	Atomic structure: Electron orbits – Atomic spectra – Bohr atom – Energy levels and spectra– Absorption spectra

Week 15	Finite nuclear mass correction, Sommerfeld model – Bohr's quantization rule,
Week 16	–Bohr's correspondence principle, Vector atom model, L-S and j-j coupling.
Week 17 (5^{th} -9^{th} May, 2025)	**Revision Week**
Week 18 (13^{th} – 22^{nd} May, 2025)	**Major Examinations**
29^{th} May, 2025	**Showing of Major Exams Answer Sheets**

Course Outcomes: Upon successful completion of this course, students will be able to:

CO1: Understand the fundamentals of Special and Analyze the behavior of matter and radiation.
CO2: Derive and solve problems using the Schrödinger equation, apply the concept of wave functions and operators and
CO3: Explain the quantum mechanical treatment of the hydrogen atom, including the Schrödinger equation,
CO4: Develop an understanding of atomic structure, including electron orbits, atomic spectra, and the Bohr model of the atom.

Recommended Books:

1. Concepts of Modern Physics, Arthur Beiser, Tata McGraw Hill, (2002), 6th Edition.
2. Introduction to Modern Physics, H. S. Mani and G. K. Metha, Affiliated East-West Press, (1988

Calendar of Quizzes/Assignment etc. to be provided as per below details and exact dates to be fixed in consultation with other course coordinators to avoid overlap of Quizzes of different courses.

Component	**Date**
Quiz-I	**27^{th} -31^{st}, January 2025**
Quiz-II	**24^{th} -28^{th} February, 2025**
Assignment-I	**10^{th} -12^{th} February, 2025**
Mid-Term	**17-21^{st} March, 2025**
Assignment-II/ Project Submission	**21^{st} – 24^{th} April, 2025**
Quiz-III	**7^{th} – 11^{th} April, 2025**
Quiz-IV	**28^{th} April-2nd, May, 2025**
Major Exam	**13^{th} – 22^{nd} May, 2025**

Note:

1. **One surprise Quiz may be fixed out of Quiz-II, Quiz-III or Quiz-IV.**
2. **In case of any deviation in evaluation methodology for courses such as AEC/VAC/SEC shall be mentioned accordingly. Thus, same shall be approved by the next BOS of school if not done earlier.**

Signature of Course Coordinator :