(Integrated Bachelor-Masters Programme)
IBMP (B Sc.- M Sc. Physics) Semester - II

Course Code	IS02CPHY51	Title of the Course	Foundations in Physics -II
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	1. The basic objective of this course on foundations in Physics that contains specifically basics of quantum mechanics and its applications, the electromagnetic waves, its properties, laser production and applications. 2. It also aims to provide detail descriptions of the mathematical foundations.

Course Content		
Unit	Description	Weightage* (%)
1.	**Elements of Quantum Mechanics**: Blackbody Radiation, Planck's Quantum Hypothesis, Particle Picture of Radiation –Photons, Photoelectric Effect , Compton Scattering, Wave-Particle Duality, , De Broglie Hypothesis, De Broglie's Justification of Bohr's Postulate, Spectral Lines, Bohr's Model of Atom, Energy Level Diagram, Properties of Matter Waves, Davisson–Germer Experiment, Wave Packet – Represents a Micro particle, Applications of De Broglie Waves, Heisenberg Uncertainty Principle, Proof of Uncertainty Principle Using De Broglie Wave Concept, Applications of Uncertainty Principle. Wave Function and Probability Interpretation, Schrödinger Wave Equation, The Free Particle, One dimensional potential well.	50%
2.	**Electromagnetic Waves** Maxwell's Equations, Electromagnetic Wave Equations for Free Space, Uniform Plane Waves, Electromagnetic Energy Density, The Poynting Theorem. Nature of Light, Optical Medium, Homogeneous Isotropic Medium, Reflection and Refraction, Total Internal Reflection, Reflectivity, Transmissivity and Absorption Interaction of Light With Matter and the Quantum Processes, Einstein Coefficients and their Relations, Light Amplification, Components of Laser, Lasing Action, Pumping Methods, Threshold Condition for Lasing, Types of Lasers, Laser Beam Characteristics, Applications of Lasers.	50%

Teaching-Learning Methodology	Direct Teaching through Chalk- and Black board ICT enabled teaching Question-Answer and Problem solving Laboratory assisted learning

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Built up the basics foundations of quantum mechanics and its applications for understanding various natural phenomena.
2.	Learn the basics of electromagnetic waves and its mathematical details with applications in various fields.
3.	Get a wider perspective of light as electromagnetic wave and be able to understand various properties associated with light in terms of its wave – particle nature.
4.	Understand the quantum mechanical processes involving light and matter interactions, and understand the production of laser and laser action.

Suggested References:	
Sr. No.	References
1.	A TEXTBOOK OF ENGINEERING PHYSICS Dr. M.N. Avadhanulu and Dr. P.G. Kshirsagar (Revised Ed. 2014) S. CHAND & COMPANY PVT. LTD, NEW DELHI-110 055 Elements of Properties of Matter D.S. Mathur S. Chand & Co., New Delhi (2006)
2.	Quantum mechanics an introduction by W. Greiner, fourth Ed. Springer 2001
3.	The Feyman Lectures on Physics Vol-I,chap: 44, 45
4.	Fundamentals of Physics (Fourth Ed) David Halliday, Robert Resnik ands Jearl Walker Wiley-A B Books Pvt Ltd New Delhi, 1994, Chap: 19,20,21,22

On-line resources to be used if available as reference material
On-line Resources
Quantum Physics and Mechanics Courses - edX https://www.edx.org › learn › quantum-physics-mechan... **Quantum physics [electronic resource] in SearchWorks catalog** https://searchworks.stanford.edu › **A new multimedia resource for teaching quantum mechanics** https://aapt.scitation.org › Electromagnetic Radiation https://www.nrcan.gc.ca › introduction › electromagneti.. **Electromagnetic Waves - NCERT** https://ncert.nic.in › textbook › pdf › leph108 **Laser Fundamentals I - MIT OpenCourseWare** https://ocw.mit.edu › resources › laser-fundamentals-i **The Physics of Lasers: Teacher Edition** http://www.laserfest.org › resources › lesson-teacher **electromagnetic radiation | Spectrum, Examples, & Types** https://www.britannica.com › ... › Matter & Energy

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