NIRMA UNIVERSITY
Institute of Technology
Physics
B. Tech. First Year (Semester – I/II)

L	T	P	C
2	1	2	4

Course Code	**PY103**
Course Title	**Physics**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -
1. Acquire the knowledge of fundamental principles of physics and relate to the engineering science,
2. Apply the concepts of Physics for solving Engineering problems,
3. Relate principles of Physics for solving new and challenging problems of technology.

Syllabus:	Teaching hours: 30
Physics of Nanomaterials: Introduction to Quantum Physics: Particle in a three dimensional box, Introduction – Nanoscale; Nanomaterials: Methods for synthesis of nanomaterials, Properties of nanomaterials – Electrical, Magnetic, Optical, Mechanical, Characterization techniques – X ray Diffraction (XRD) - Single Crystal, Powder and Laue techniques, Low energy Electron Diffraction (LEED), Scanning Electron Microscopy, Tunnelling Electron Microscopy, Nanostructures; Carbon nanotubes Characteristics and applications, Nanotechnology and environment.	06
Lasers and Holography: Introduction, Basics of Interaction of radiation with matter, Condition for light Amplification, Population inversion and metastable state, pumping, the principle pumping scheme: Three and Four level scheme, Construction and working of optical resonator, Optical amplifier, Applications of laser beam, Holography.	06
Introduction to Fiber Optics: Introduction of fiber-optic system, Principle and construction of fiber cable, Acceptance angle and numerical aperture, Types of Optical fiber: Based on material & based on mode of propagation, Index profile, Fiber optic communication link, Fiber optic sensor, Advantages of fiber optic system.	04
Nuclear and Plasma Physics: Introduction to nuclear physics, types of nuclear reactions, nuclear reaction cross sections, Radius of Gyration, particle accelerators – pinch of synchrotron radiation, nuclear fission as a source of energy, Nuclear radiation counters – Geiger Mullar Counter, scintillation counter. Basic concepts of Plasma physics: Introduction to Electrostatics and Electromagnetics, Curl, Divergence and Gradient of fields, Maxwell's equations, Motion of charged particle in E and B homogeneous field, Pinch effect, Magnetic trapping of plasma, Van Allen radiation belt.	05
Physics of Vacuum Techniques and Cryogenics: Creation of vacuum with different pumps-rotary pump, diffusion pump, Measurement of vacuum with different gauges; Need of vacuum in Plasma unit, Cryogenics – use of liquid Nitrogen and liquid Helium, Applications of cryogenics in refrigeration, space and medical field	04
Engineering of Auditorium and Ultrasonics: Introduction, Defection due to reflection of sound, Sabine's empirical formula, Reverberation theory, Eyring's equation, Acoustical defects and their remedies, Acoustic materials, Ultrasonic waves, Piezoelectric method, Properties and application of ultrasonic waves	05

Self- Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:
1. M N Avadhnulu and P. Kshirsagar, A Text Book of Engineering Physics, S Chand.
2. T. Pradeep, Nano: The Essentials, New Central book Agency.
3. S. N. Goswami, Elements of Plasma Physics, Tata McGraw Hill publication.
4. B. L. Theraja, Physics for Engineers, S Chand Publication

L= Lecture, T= Tutorial, P= Practical, C= Credit