MODERN PHYSICS

II Semester: AE / ME/CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS008	Foundation	3	1	3	4	30	70	100
Contact Classes: 45	Tutorial Classes: 12	Practical Classes: 42				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Develop strong fundamentals of crystal structures and properties.
II. Meliorate the knowledge of theoretical and technological aspects of lasers.
III. Correlate principles with applications of the x-ray diffraction and defects in crystals.
IV. Enrich knowledge in modern engineering principles of interference and diffraction

COURSE LEARNING OUTCOMES (CLOs):

1. Recall the basic principles of physics and apply these concepts of physics in solving the real-time problems..
2. Acquire knowledge of basic terms related to crystals, crystal systems, Bravais lattices and Miller Indices.
3. Discuss in detail different crystal structures and calculate their packing factors..
4. Describe different X-ray diffraction in research and development for the study of internal structures of materials.
5. Identify various types of defects in crystals and their effect on structure sensitive properties.
6. Understand the basic principles involved in the production of Laser light and also real-time applications of lasers.
7. Explain the principle involved in working of different types of laser systems.
8. Analyze basic laws of physics to correlate the mechanism of sensors in day to day life. Principle of sensor along with their applications.
9. Understand the importance of various sensors in real-time applications like measurement of pressure in aeronautics, detecting submarines in acoustics.
10. Recollect basic principle, construction, types and attenuation of optical fibers.
11. Apply properties of optical fibers in various real-time applications like measurement of pressure, temperature, displacement etc.,
12. Understand the importance of optical fibers in real-time communication system.
13. Interpret phenomenon of interference in thin films using Newton's rings experiment
14. Identify difference in diffraction phenomenon due to single slit and N-slits
15. Apply different laws of radiation to understand the phenomenon behind production of light.

UNIT-I	CRYSTALLOGRAPHY AND CRYSTAL STRUCTURES
Crystallography and crystal structures: Space lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, directions and planes in crystals, Miller indices, interplanar spacing of orthogonal crystal systems, atomic radius, coordination number and packing factor of SC, BCC, FCC, NaCl and diamond structures.	
UNIT-II	**X-RAY DIFFRACTION AND DEFECTS IN CRYSTALS**
X-ray diffraction: Bragg's law, Laue method, powder method and applications; Defects in crystals: Concepts of point defects, vacancies, substitutional, interstitial, frenkel, schottky defects, line defects and Burger's vector.	
UNIT-III	**LASERS AND SENSORS**
Lasers: Characteristics of lasers, spontaneous and stimulated emission of radiation, metastable state, population inversion, lasing action, ruby laser, semiconductor diode laser and applications of lasers. Sensors: Introduction, basic principles, sensor materials and applications: principle of pressure, optical, acoustic and thermal sensing.	
UNIT-IV	**FIBER OPTICS**
Fiber optics: Principle and construction of an optical fiber, acceptance angle, numerical aperture, types of optical fibers (Single mode, multimode, step index, graded index), attenuation in optical fibers, application of optical fibers and optical fiber communication system with block diagram.	
UNIT-V	**INTERFERENCE AND DIFFRACTION**
Interference: Phase difference, path difference, coherence, conditions for constructive and destructive interference, interference in thin films due to reflected light, Newton rings experiment. Diffraction: Introduction, differences between interference and diffraction, types of diffraction, Fraunhofer diffraction due to single slit, N-slits, diffraction grating experiment.	
Text Books:	
1. V. Rajendran, "Engineering Physics", Tata Mc Graw Hill Book Publishers, 1st Edition, 2010. 2. Dr. K. Vijaya Kumar, Dr. S. Chandralingam, "Modern Engineering Physics", S. Chand & Co., New Delhi, 1st Edition, 2010.	
Reference Books:	
1. P. K. Palanisamy, "Engineering Physics", Scitech Publishers, 4th Edition, 2014. 2. R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 8th Edition, 2001. 3. A. J. Dekker, "Solid State Physics", Macmillan India ltd, 1st Edition, 2000. 4. Hitendra K. Malik, A. K. Singh, "Engineering Physics", Mc Graw Hill Education, 1st Edition, 2009.	