MODERN PHYSICS

II Semester: AE/CE/ ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS008	Foundation	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

I. COURSE OVERVIEW:

This course develops abstract and critical reasoning by studying mathematical and logical proofs and assumptions as applied in basic physics and to make connections between physics and other branches of sciences and technology. The topics covered include crystallography, X-ray diffraction, and defects in crystals, LASERs, sensors, fiber optics, interference and diffraction. The course helps students to gain knowledge of basic principles and appreciate the diverse applications in technological fields in respective branches and also in their lives.

II. OBJECTIVES:

The course should enable the students to:

I. Develop strongfundamentals of crystal structures and properties.
II. Meliorate the knowledge of theoretical and technological aspects of lasers and optical fibers.
III. Correlateprincipleswithapplicationsof the x-ray diffraction and defects in crystals.
IV. Enrich knowledge in modernengineering principles of interference and diffraction.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Make use of** space lattice, unit cell, lattice parameters and coordination number to calculate the packing factor of different crystalstructures.	Apply
CO 2	**Apply** Bragg's law of X-Ray diffraction to study the defects in crystal with illustrative examples of point and line defects.	Apply
CO 3	**Compare** the concepts of Laser and normal light in terms of mechanism and working principles for applications in different fieldsand scientific practices.	Understand
CO 4	**Utilize** the importance of sensor materials in different real timeapplications.	Apply
CO 5	**Explain** functionality of components in optical fiber communication system by using the basics of signal propagation, attenuation and dispersion.	Understand
CO 6	**Interpret** the phenomenon of interference and diffraction by using theprinciples of wave motion and superposition.	Understand

IV. SYLLABUS:

UNIT-I	CRYSTALLOGRAPHY AND CRYSTAL STRUCTURES	Classes: 12

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.	Classes: 15

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	Classes: 10
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**	**Classes: 12**
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**	**Classes: 11**
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. Dr. K. Vijaya Kumar, Dr. S. Chandralingam, "Modern Engineering Physics", S. Chand & Co. New Delhi, 1st Edition, 2010.
2. Rajendran, "Engineering Physics", Tata Mc Graw Hill Book Publishers, 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", McGraw Hill Education, 1st Edition, 2009.

Web References:

1. http://link.springer.com/book
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

E-Text Books:

1. http://www.peaceone.net/basic/Feynman/
2. http://physicsdatabase.com/free-physics-books/
3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html

Course Home Page: