ENGINEERING PHYSICS

[As per Choice Based Credit System (CBCS) scheme]

(Effective from the academic year 2015 -2016)

SEMESTER - I/II

Subject Code	15PHY12 / 15PHY22	IA Marks	20
Number of Lecture Hours / Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

COURSE OBJECTIVES:

The Objective of this course is to make students learn and understand basic concepts and principles of physics to analyze practical engineering problems and apply its solutions effectively and meaningfully. To understand building up of models, design issues, practical oriented skills and problem solving challenges are the great task of the course. To know about shock waves and practical applications is the prime motto to introduce new technology at the initial stage of Engineering.

Module -1	**Teaching Hours**
Modern Physics and Quantum Mechanics Black body radiation spectrum, Assumptions of quantum theory of radiation, Plank's law, Weins law and Rayleigh Jeans law, for shorter and longer wavelength limits. Wave Particle dualism, deBroglie hypothesis.Compton Effect. Matter waves and their Characteristic properties, Definition of Phase velocity and group velocity, Relation between phase velocity and group velocity, Relation between group velocity and particle velocity. Heisenberg's uncertainity principle and its application, (Non-existence of electron in the nucleus).Wave function, Properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one dimensional time independent Schrodinger wave equation. Eigen values and Eigen functions.Application of Schrodinger wave equation for a particle in a potential well of infinite depth and for free particle.	**10 Hours**
Module -2	
Electrical Properties of Materials Free–electron concept (Drift velocity, Thermal velocity, Mean collision time, Mean free path, relaxation time). Failure of classical free electron theory. Quantum free electron theory, Assumptions, Fermi factor, density of states (qualitative only) Fermi–Dirac	**10 Hours**

Statistics. Expression for electrical conductivity based on quantum free electron theory, Merits of quantum free electron theory. Conductivity of Semi conducting materials, Concentration of electrons and holes in intrinsic semiconductors, law of mass action. Temperature dependence of resistivity in metals and superconducting materials. Effect of magnetic field (Meissner effect). Type I and Type II superconductors–Temperature dependence of critical field. BCS theory (qualitative). High temperature superconductors. Applications of superconductors –. Maglev vehicles.	
Module – 3	
Lasers and Optical Fibers Einstein's coefficients (expression for energy density). Requisites of a Laser system. Condition for laser action. Principle, Construction and working of CO_2 laser and semiconductor Laser. Applications of Laser – Laser welding, cutting and drilling. Measurement of atmospheric pollutants. Holography–Principle of Recording and reconstruction of images. Propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation,Block diagram discussion of point to point communication, applications.	**10 Hours**
Module – 4	
Crystal Structure Space lattice, Bravais lattice–Unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter – planar spacing. Co-ordination number. Atomic packing factors (SC, FCC, BCC). Bragg's law, Determination of crystal structure using Bragg's X–ray difractometer. Polymarphism and Allotropy. Crystal Structure of Diamond, qualitative discussion of Pervoskites.	**10 Hours**
Module – 5	
Shock waves and Science of Nano Materials Definition of Mach number, distinctions between- acoustic, ultrasonic,subsonic and supersonic waves. Description of a shock wave and its applications. Basics of conservation of mass, momentum and energy.Normal shock equations (Rankine-Hugonit equations). Method of creating shock waves in the laboratory using a shock tube, description of hand operated Reddy shock tube and its characteristics. Introduction to Nano Science, Density of states in 1D, 2D and 3D structures. Synthesis: Top–down and Bottom–up approach, Ball Milling and Sol–Gel methods. CNT – Properties, synthesis: Arc discharge, Pyrolysis methods, Applications. Scanning Electron microscope: Principle, working and applications.	**10 Hours**

Course outcomes:

On Completion of this course, students are able to –

C102.1 Apply concepts of Quantum Mechanics and Modern Physics for acquiring the problem solving skills.

C102.2 Employ material properties and their engineering applications.

C102.3 Illustrate lasers and optical fibers and its applications in the field of communications.

C102.4 Sketch crystal structure and its applications to boost the skill of building up models.

C102.5 Interpret basic concepts of nano science and technology and Shock waves and its applications to gain the knowledge of the initial stage of engineering.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 16 marks
- There will be **2** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer **5** full questions, selecting one full question from each module.

Text Books:

1. Wiley precise Text, **Engineering Physics,** Wiley India Private Ltd., New Delhi. Book series – 2014
2. Dr. M.N. Avadhanulu, Dr. P.G.Kshirsagar, **Text Book of Engineering Physics,** S Chand Publishing, New Delhi – 2012

Reference Books:

1. S.O.Pillai, **Solid State Physics, New** Age International. Sixth Edition.

2. Chintoo S Kumar ,K Takayana and K P J Reddy, **Shock waves made simple,** Willey India Pvt. Ltd. New Delhi,2014

3. A Marikani, **Engineering Physics,** PHI Learning Private Limited, Delhi -2013

4. Prof. S. P. Basavaraju, **Engineering Physics,** Subhas Stores, Bangalore – 2

5. V Rajendran ,**Engineering Physics,** Tata Mc.Graw Hill Company Ltd., New Delhi - 2012

6. S Mani Naidu, **Engineering Physics,** Pearson India Limited – 2014

ENGINEERING PHYSICS LAB

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(Effective from the academic year 2015 -2016)

SEMESTER - I/II

Laboratory Code	15PHYL17 / 15PHYL27	IA Marks	20
Labs / Instructions Hours / Week	3 (1 hr Tutorial +2 hrs lab)	Exam Marks	80
Total Number of Lecture Hours	48	Exam Hours	03

CREDITS – 02

Course Objectives:

- The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.

- Design of circuits using new technology and latest components and to develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

EXPERIMENTS:

1. Black box experiment; Identification of unknown passive electrical components and determine the value of Inductance and Capacitance.

2. Series and parallel LCR Circuits. (Determination of resonant frequency and quality factor)

3. I–V Characteristics of Zener Diode. (determination of knee voltage, zener voltage and forward resistance)

4. Characteristics of Transistor. (Study of Input and Output characteristics and calculation of input resistance, output resistance and amplification factor)

5. Photo Diode Characteristics (Study of I–V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage and intensity).

6. Dielectric constant (Measurement of dielectric constant).

7. Diffraction (Measurement of wavelength of laser source using diffraction grating).
8. Torsional pendulum (Determination of M.I. of wire and Rigidity modulus).
9. Determination of Fermi energy. (Measurement of Fermi energy in copper).
10. Uniform Bending Experiment (Determination of Youngs modulus of material bar).
11. Newton's Rings, (Determination of radius of curvature of plano convex lens).
12. Verification of Stefan's Law.

Course Outcomes:

On Completion of this course, students are able to –

C107.1 Apply practical skills using visible electromagnetic spectrum for different measurements.

C107.2 Use practical knowledge with hands on experience with basic electrical and electronics experiments.

C107.3 Interpret practical skill in the area of mechanical measurements.

Note: 1) All the above twelve experiments are to be conducted

2) Two experiments are to be performed by the students in the examination