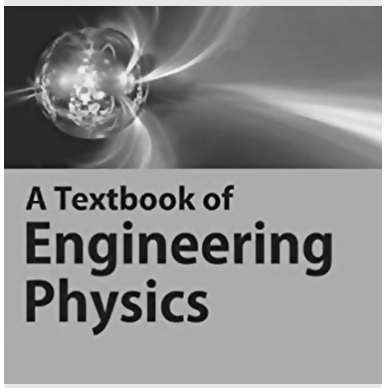
22PY102 ENGINEERING PHYSICS (AME, MECH, CIVIL, TT, PE, CHEM)



Source: https://arcus-www.amazon.in/Textbook-Engineering-Physics-M-Avadhanulu/dp/9352833996

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Atomic structure, Electronic transitions, Bonding in solids and Wave optics.

COURSE DESCRIPTION AND OBJECTIVES:

The course is aimed at realizing the concept of waves in understanding the applications of ultrasonics and quantum optics in lasers. It imparts knowledge on distinguishing crystal structures and synthesis of nanomaterials and their characterization.

MODULE – 1

UNIT-1 **8L+0T+8P=16 Hours**

WAVES AND OSCILLATIONS:

Waves & Oscillation: Simple harmonic motion & Free oscillations - Equation of motion -Energy expressions; Damped Oscillations - Differential equation - different cases of damping - logarithmic decrement - relaxation time - quality factor; Forced Oscillations - Difference between free and forced oscillations - equation of motion - expression for amplitude and phase; Resonance and its examples

Ultrasonics: Introduction – properties of ultrasonic waves - Production of ultrasonic waves by Piezoelectric Method-Determination of velocity of ultrasonic waves in liquids -Interferometer method - NDT - Ultrasonic testing & X-ray radiography.

UNIT-2 **8L+0T+8P=16 Hours**

LASERS AND OPTICAL FIBERS:

Lasers: Introduction to Laser - population inversion and pumping methods - CO2 laser - Laser applications in industry and scientific research; Holography - construction of hologram - reconstruction of image and applications.

Fibre Optics: Introduction – Classification - Step and Graded index fibres - Acceptance Angle - Numerical aperture - Fibre optic sensors and types of sensors.

PRACTICES:

- Melde's experiment- Determination of frequency of a given tuning fork
- Ultrasonic Interferometer-Determination of the velocity of ultrasonic waves in liquids
- Semiconductor laser- Determination of wavelength
- Optical fibre- Determination of Numerical Aperture and Acceptance angle

MODULE-2

UNIT-1 **8L+0T+8P=16 Hours**

CRYSTAL PHYSICS:

Fundamental terms of crystal Physics - Lattice parameters - Crystal Systems-Packing factor for SC, BCC and FCC - Miller Indices - Important planes of cubic crystal system - Distance of separation between successive (h k l) planes - X-ray diffraction – Bragg's law - Defects in solids - Point defects - Line defects - Edge & Screw dislocations.

SKILLS:

- ✓ *To apply Ultrasonic waves in non-destructive testing.*
- ✓ *To compute the power of the laser and the signal carrying capacity of optical fiber.*
- ✓ *To distinguish various crystals and the orientation of crystal planes.*
- ✓ *To demonstrate the synthesis and characterization of nanoparticles in view of their application.*

UNIT-2 **8L+0T+8P=16 Hours**

NANOMATERIALS AND THEIR CHARACTERIZATION:

Introduction to nanoscience and technology-surface area to volume ratio & quantum confinement; Synthesis of nanomaterials Top-down & Bottom-up approach, Ball milling- Sol-Gel method; Applications of nanotechnology in various fields; X-Ray Diffraction -Bragg's law - Powder method - Electron microscopy-(SEM &TEM); Atomic force microscopy (AFM).

PRACTICES:

- Semiconductor- Determination of Bandgap.
- Diffraction grating- Determination of wavelength of a given light source.
- Photoelectric effect- Determination of Planks constant.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the knowledge of mechanical and sound waves from the perspective of engineering applications.	Apply	1	1, 2, 3, 4 , 9, 10
2	Analyze the wavelengths of lasers for relevant diverse applications and foster the knowledge to realize fiber optic sensors.	Analyze	1	1, 2, 5, 9, 10
3	Apply the knowledge of crystal geometry to distinguish solids.	Apply	2	1, 2, 3, 4, 5, 9, 10
4	Compute the dimensions of nano particles to the physical and chemical aspects of nanomaterials.	Evaluate	2	1, 2, 3, 4, 9, 10

TEXT BOOKS:

1. S.O. Pillai, "Solid State Physics", New age International publishers, 8th edition, 2018.
2. H.P. Myers, "Introduction to Solid State Physics", Taylor & Francis, 2009.
3. V. Rajendran, "Engineering Physics", Tata Mc-Graw Hill Publications, 2016.

REFERENCE BOOKS:

1. D. Halliday, R. Resnick and J. Walker, "Fundamentals of Physics", 6th edition, John Wiley and Sons, New York, 2001.
2. Charles Kittel, "Introduction to Solid State Physics", 7th edition, Wiley, Delhi, 2007.
3. Donald A. Neamen, "Semiconductor Physics and Devices: Basic Principle", 4th edition, McGraw-Hill, New York, 2012.
4. N.W. Ashcroft and N.D. Mermin, "Solid State Physics", International student edition, Brooks Cole, 2008.