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PH1001T ENGINEERING PHYSICS

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OBJECTIVES:

Enable the students to

- Understand the characteristics of sound; production and applications of ultrasound.
- Develop an understanding of quantum mechanical concepts and associated theories.
- Explain physics of semiconductors.
- Describe the principle of laser action and working of lasers.
- Analyse the propagation of light through optical fibres and losses in fibre optic communication.

ACOUSTICS: 4

Classification- Music & Noise - Characteristics of Sound: Pitch/Frequency, Loudness/Intensity- decibel scale - Weber–Fechner law – Loudness Curves- Quality/Timbre

ULTRASONICS: 5

Production - Magnetostriction and Piezoelectric methods – Detection – Piezoelectric, Acoustic grating – Non Destructive Testing – pulse echo system -reflection and transmission modes – Modes of data presentation- A, B and C scan displays – Sonogram.

QUANTUM PHYSICS **9**

Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh-Jeans law from Planck's theory – Properties of Matter waves - wave particle duality - Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box and extension to three dimensional box – Degeneracy of electron energy states – Quantum free electron theory – Density of states – Fermi-Dirac statistics– Free electron concentration in metals.

SEMICONDUCTORS **9**

Classification of semiconductors based on doping and band gap – Intrinsic semiconductor – Concept of hole – carrier concentration derivation –Fermi level and its variation with temperature – electrical conductivity – band gap determination –Extrinsic semiconductors – Carrier concentration derivation in n-type and p-type semiconductors – Variation of Fermi level with temperature and impurity concentration.

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LASERS **9**

Interaction of Radiation with Matter-Spontaneous and stimulated emissions– Einstein's A and B coefficients – Conditions for Laser action –Population inversion – Active medium – pumping schemes – Optical resonant cavity- Light Amplification-Types of lasers – Nd: YAG, CO_2 and Semiconductor lasers- homo junction & hetero junction laser.

FIBRE OPTICS **9**

Principle and propagation of light in optical fibres –Numerical aperture and Acceptance angle, Classification of optical fibres (material, mode & refractive index) – Losses in fibres – attenuation, dispersion – Fibre optical communication system (Block diagram) – Active and passive sensors – pressure, strain, displacement.

Total hours 45

TEXT BOOKS:

1. M. N. Avadhanulu, P. G. Kshirsagar , "A text book of Engineering Physics" , S. Chand & Co. Ltd. Revised Edition 2014

OUTCOMES:

At the end of this course, the students will be able to

PH1001T: CO1 Describe the characteristics of sound, production of ultrasonic waves and their applications.

PH1001T: CO2 Explain the basic quantum mechanical concepts and their applications.

PH1001T: CO3 Analyse the physics of semiconductors.

PH1001T: CO4 Elucidate the principle and working of different type of lasers.

PH1001T: CO5 Explicate the principle of light propagation, causes for losses and dispersion in fibre optic communication and working of fiberoptic displacement, pressure and strain seneors

REFERENCE BOOKS:

1. Kasap, S.O., Principles of Electronic Materials and Devices, (Special Indian Editio McGraw-Hill Education, 3rd Edition, 2017.
2. Kittle Charles, "Introduction to Solid State Physics", Wiley, 2004
3. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai publishers, 2012
4. Halliday, D., Resnick, R. & Walker, J. — Principles of Physics. Wiley, 2015.
5. James Beauchamp (Editor) - Analysis, Synthesis, and Perception of Musical Sounds –The Sound of Music- Springer; 2007 th Edition (December 19, 2006)
6. Serway, R.A. & Jewett, J.W. — Physics for Scientists and Engineers. Cengage Learning, 2010.
7. Tipler, P.A. & Mosca, G. — Physics for Scientists and Engineers with Modern Physics', W.H.Freeman, 2007.