ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
UGC Autonomous
(Affiliated to AU, Approved by AICTE & Accredited by NBA & NAAC with 'A' Grade)
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DEPARTMENT OF PHYSICS

(Common for all Branches)

ENGINEERING PHYSICS (THEORY) – R-15

L-T-P-E-O-C

3- 0-0-1- 4 -3

Sessional Marks : 40   End Exam Marks : 60

Course Objectives

➢ To impart knowledge in basic concepts of physics relevant to engineering applications

➢ To introduce advances in technology for engineering applications

Course Outcomes

The students will be able to

CO-1	Interpret the relation between heat, work and entropy with thermodynamic laws.
CO-2	Explain and analyze the relation between electric current and magnetic fields, production and applications of ultrasonics.
CO-3	Apply the optical phenomena like Interference, Diffraction and Polarization to various fields.
CO-4	Explain the working principle and applications of lasers and fiber optics.
CO-5	Interpret the microscopic behavior of matter with quantum mechanics.

CO-PO Mapping   **ENGINEERING PHYSICS THEORY**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	0	0	0	0	2	0	0	1
CO2	3	2	1	0	0	0	0	0	2	0	0	0
CO3	3	1	0	0	2	0	0	0	2	0	0	1
CO4	3	1	0	0	0	0	0	0	2	0	0	0
CO5	3	2	2	0	0	0	0	0	2	0	0	1

UNIT – I   10 periods

Thermodynamics:

Heat and work, first law of thermodynamics and its applications, reversible and irreversible processes, heat engine, Carnot cycle and its efficiency, Carnot's theorem, second law of thermodynamics, entropy – entropy change in reversible and irreversible processes, entropy and second law, entropy and disorder, entropy and probability, third law of thermodynamics.

A text book of Engineering Physics   --   M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:
The students will be able to

- Explain the relation between heat and work.
- Recognize how much heat is converted into work.
- Identify the relation between entropy and different thermodynamic phenomena.

UNIT-II   10 periods

Electromagnetism:

Faraday's law of induction , Lenz's law, Integral and differential forms of Faraday's law , self-inductance, energy stored in electric and magnetic fields, Poynting vector, displacement current, Maxwell's equations in integral form   (no derivation), wave equation, propagation of electromagnetic waves in free space.

Physics   -   Resnick & Halliday Volume II Wiley India Publications

Ultrasonics: Properties of ultrasonic waves, production of ultrasonic waves by magnetostriction and piezoelectric methods, applications of ultrasonics.

A text book of Engineering Physics   --   M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:

The students will be able to

- Explain how to generate electric current by electromagnetic induction Phenomena.
- Evaluate maxwells displacement current and correction in ampere's law.
- Assess electromagnetic wave propagation in free space and its power.
- Recognize the properties and production of ultrasoncs.
- Identify the use of ultrasonics in different fields.

UNIT–III   10 periods

Optics

Interference: Introduction, principle of superposition, coherence, Young's double slit experiment, conditions for interference, interference in thin films by reflection, wedge shaped film and Newton's rings

Diffraction: Introduction, Fresnel and Fraunhofer diffraction, diffraction at a single slit

Polarisation: Introduction, types of polarized light, double refraction in uniaxial crystals, Nicol's prism, quarter and half-wave plate, production and detection of plane, circular and elliptically polarized light.
A text book of Engineering Physics M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications.

Learning Outcomes:

The students will be able to
- Explain various types of coherent sources.
- Outline the conditions for sustained interference.
- Aanalyze the differences between interference and diffraction.
- Illustrate the concept of polarization of light and its applications.
- Classify the production and detection of different polarized light.

UNIT–IV   10 periods

Lasers: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, semiconductor laser, applications of lasers
Fibre optics: Introduction to optical fibers, principle of propagation of light in optical fibers,, acceptance angle and acceptance cone, numerical aperture, types of optical fibers, modes of propagation and refractive index profiles, attenuation in optical fibers, advantages of optical fibers in communications, fiber optics communication system, applications of optical fibers, fiber optic sensors
Modern Engineering Physics - S.L.Gupta & Sanjeev Gupta, Dhanpat Rai Publications

 Learning Outcomes:

The students will be able to
- Explain the working principle and properties of lasers
- Analyze the production and applications of lasers.
- Explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation.
- Identify the applications of optical fibers in medical, communication and other fields.

UNIT–V   10 periods

Quantum mechanics:

Planck's hypothesis, wave-particle duality, introduction to quantum theory, de-Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent and time dependent wave equations, physical significance and properties of the wave function ψ , application of Schrodinger wave equation for a particle in one dimensional well – Eigen wave functions and energy Eigen values of the particle

Elements of Statistical mechanics: Elementary concepts of Maxwell-Boltzman , Bose-Einstein and Fermi-Dirac statistics (no derivation)
Modern Engineering Physics -- S.L.Gupta & Sanjeev Gupta, Dhanpat Rai Publications
Engineering Physics   --   M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:

The students will be able to
- Explain the dual nature of radiation and matter.
- Realize de Broglie concept of matter waves and Heisenberg uncertain principle.
- Identify Schrodinger wave equation to solve the problems.
- Explain the importance of fundamentals of statistical mechanics.

Text Books :
1. M.N.Avadhanulu & P.G.Kshirasagar, "A Text Book of Engineering Physics" – IX Edition, S.Chand Publications, 2014.
2. S.L.Gupta & Sanjeev Gupta, "Modern Engineering Physics" -- Dhanpat Rai Publications, 2011.

Reference Books:
1) V. Rajendran, "Engineering Physics" , McGrawHill Education Private Ltd, 2011.
2) S.O.Pilai, Sivakami , "Engineering Physics" – IV Edition, New Age International Publishers , 2011.
3) Young & Freedman, "University Physics" – XI Edition, Pearson Education, 2004.
4) A.Marikani, "Engineering Physics" -   PHI Learning Private Limited, 2009.
5) Resnick & Halliday, "Physics" Volume II – VI Edition,WileyIndia Publications 2001.
6) R K Gaur, S L Gupta, "Engineering Physics" – VIII Edtion, Dhanpat Rai Publications, 2001.
7) D.K.Bhattacharya, Poonam Tandon, "Engineering Physics" – Oxford University Press, 2010.