ENGINEERING PHYSICS

(Common to all branches)

Course Code - Category: CSE 122 - BS **Credits:3**

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3	0	0	1	4

Sessional Marks:40

End Exam: 3 Hours 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

CO1	terpret the relation between heat, work and entropy with thermodynamic laws.
CO2	xplain and analyze the relation between electric current and magnetic fields, production and applications of ultrasonics.
CO3	pply the optical phenomena like Interference, Diffraction and Polarization to various fields.
CO4	xplain the working principle and applications of lasers and fiber optics.
CO5	terpret the microscopic behavior of matter with quantum mechanics.

SYLLABUS

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.

Learning Outcomes:

At the end of this unit, the student 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.

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

Learning Outcomes:

At the end of this unit the student will be able to

- Explain how to generate electric current by electromagnetic induction Phenomena.
- Evaluate Maxwell's displacement current and correction in ampere's law.

- Assess electromagnetic wave propagation in free space and its power.
- Recognize the properties and production of ultrasonics.
- 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.

Learning Outcomes:

At the end of this unit the student will be able to

- Explain various types of coherent sources.
- Outline the conditions for sustained interference.
- Analyze 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

Learning Outcomes:

At the end of this unit the student 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)

Learning Outcomes:

At the end of this unit the student 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.