RSET
RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY
(Autonomous)

RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

B.TECH. DEGREE PROGRAMME

SECOND SEMESTER

(2020 ADMISSIONS)

100906/PH900B	ENGINEERING PHYSICS A

SYLLABUS

Rajagiri Valley, Kakkanad,
Kochi 682 039, Kerala, INDIA
www.rajagiritech.ac.in

COURSE CODE	COURSE NAME	L	T	P	CREDIT	YEAR OF INTRODUCTION
100906/PH900B	ENGINEERING PHYSICS A	4	0	0	4	2020

1. **Preamble:** The aim of the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.

2. **Prerequisite:** Higher secondary level Physics, Mathematical course on vector calculus, differential equations and linear algebra

3. **Syllabus**

Module 1

Oscillations and Waves

Harmonic oscillations, Damped harmonic motion-Derivation of differential equation and its solution, Over damped, Critically damped and Under damped Cases, Quality factor-Expression, Forced oscillations-Differential Equation-Derivation of expressions for amplitude and phase of forced oscillations, Amplitude Resonance-Expression for Resonant frequency, Quality factor and Sharpness of Resonance, Electrical analogy of mechanical oscillators

Wave motion- Derivation of one dimensional wave equation and its solution, Three dimensional wave equation and its solution (no derivation), Distinction between transverse and longitudinal waves, and Transverse vibration in a stretched string, Statement of laws of vibration

Module 2

Wave Optics

Interference of light-Principle of superposition of waves, Theory of thin films - Cosine law (Reflected system), Derivation of the conditions of constructive and destructive Interference, Interference due to wedge shaped films -Determination of thickness and test for optical planeness, Newton's rings - Measurement of wavelength and refractive index, Antireflection coatings

Diffraction of light, Fresnel and Fraunhofer classes of diffraction, Diffraction grating-Grating equation, Rayleigh criterion for limit of resolution, Resolving and Dispersive power of a grating with expression (no derivation)

Module 3

Quantum Mechanics & Nanotechnology

Introduction for the need of Quantum mechanics, Wave nature of Particles, Uncertainty principle, Applications-Absence of electrons inside a nucleus and Natural line broadening mechanism, Formulation of time dependent and independent Schrodinger wave equations- Physical meaning of wave function, Particle in a one dimensional box- Derivation for normalized wave function and energy Eigen values, Quantum Mechanical Tunneling (Qualitative)

Introduction to nanoscience and technology, Increase in surface to volume ratio for nanomaterials, Quantum confinement in one dimension, two dimension and three dimension-Nanosheets,Nano wires and Quantum dots, Properties of nanomaterials-mechanical, electrical and optical, Applications of nanotechnology (qualitative ideas)

Module 4

Magnetism & Electro Magnetic Theory

Magnetic field and Magnetic flux density, Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law in terms of EMF produced by changing magnetic flux, Magnetic permeability and susceptibility, Classification of magnetic materials-para, dia and ferromagnetic materials

Fundamentals of vector calculus, concept of divergence, gradient and curl along with physical significance, Line, Surface and Volume integrals, Gauss divergence theorem & Stokes' theorem, Equation of continuity, Derivation of Maxwell's equations in vacuum, Comparison of displacement current with conduction current.Electromagnetic waves, Velocity of Electromagnetic waves in free space, Flow of energy and Poynting's vector (no derivation)

Module 5

Superconductivity & Photonics

Superconducting phenomena, Meissner effect and perfect diamagnetism, Types of superconductors- Type I and Type II, BCS Theory (Qualitative), High temperature superconductors-Applications of super conductivity

Introduction to photonics-Photonic devices-Light Emitting Diode, Photo detectors - Junction and PIN photodiodes, Solar cells-I-V Characteristics, Optic fiber-Principle of propagation of light, Types of fibres-Step index and Graded index fibers, Numerical

aperture –Derivation, Fiber optic communication system (block diagram), Industrial, Medical and Technological applications of optical fiber, Fiber optic sensors-Intensity Modulated and Phase modulated sensors

4. Text Books

1. M.N.Avadhanulu, P.G.Kshirsagar,TVS Arun Murthy "A Text book of Engineering Physics", S.Chand &Co., Revised Edition 2019

2. H.K.Malik , A.K. Singh, "Engineering Physics" McGraw Hill Education, Second Edition 2017

5. Reference Books

1. Arthur Beiser, "Concepts of Modern Physics ", Tata McGraw Hill Publications, 6th Edition 2003
2. D.K. Bhattacharya, PoonamTandon, "Engineering Physics", Oxford University Press, 2015
3. Md.N.Khan&S.Panigrahi "Principles of Engineering Physics 1&2", Cambridge University Press, 2016
4. Aruldhas G., "Engineering Physics", PHI Pvt. Ltd., 2015
5. AjoyGhatak, "Optics", Mc Graw Hill Education, Sixth Edition, 2017
6. T. Pradeep, "Nano:The Essentials'', McGraw Hill India Ltd, 2007
7. Halliday, Resnick, Walker, "Fundamentals of Physics'', John Wiley &Sons.Inc, 2001
8. David J Griffiths, "Introduction to Electrodynamics'', Addison-Wesley publishing, 3rd Edition, 1999
9. Premlet B., "Advanced Engineering Physics", Phasor Books,10th edition,2017
10. Dominic and. A. Nahari, "A Text Book of Engineering physics", Owl Books Publishers, Revised edition, 2016

6. Course Outcomes: After the completion of the course the student will be able to

CO1: Compute the quantitative aspects of waves and oscillations in engineering systems.

CO2: Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.

CO3: Analyze the behavior of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.

CO4: Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems

CO5: Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fiber optic communication system

7. Mapping of course outcomes with program outcomes:

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

8. Assessment Pattern (marginal changes can be made according to the question paper pattern):

Learning Objectives	Continuous Internal Evaluation (CIE)		End Semester Examination (ESE out of 100)
	Internal Examination 1 (25)	Internal Examination 2 (25)	
Remember	4	4	20
Understand	4	4	25
Apply	7	7	25
Analyse	5	5	20
Evalaute	5	5	10

9. Mark Distribution

Total	CIE				ESE
	Attendance	Internal Examination	Assignment/Quiz/Course Project	Total	
150	10	25 (Average of two scores)	15	50	100

10. End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question will have 2 sub-divisions (7 marks each)and carry 14 marks.