GRAPHIC ERA UNIVERSITY, DEHRADUN
Second Semester 2016-2017
Model Course Handout

Course Code: THP 201 **Course Title:** Engineering Physics

Instructor –in-charge: Dr. Kiran Sharma & Dr. Fateh Singh Gill

Course Description:

Engineering Physics is taught in B. Tech. I/II Sem (all branches). The objective of the subject is to make the student learn about the basic theories, postulates and principles of physics and correlate it with the technological applications and advancements. The main contents of the syllabus are:

- Study of the phenomenon like interference, diffraction and polarization of light. In Interference students learn about the interference based wavelength (monochromatic) determining methods as Fresnel biprism and Newton's ring experiments. Diffraction discusses the physics and resolving power of a grating whereas the polarization elaborates the production methods of plane circular and elliptical polarized lights and their applications.
- Laser and its technological applications as holography and fibre optics. The recording and reconstruction of a transmission hologram and the basic principles associated with a fiber optic and types of fiber are discussed.
- Fundamental principles, origin and development of Einstein's special theory of relativity, concept of frame of reference, time Dilation, Length Contraction, Variation of Mass and Mass-energy relation.
- Study of development of concepts of matter weaves (De-Broglie waves) and Schrodinger wave equations (TI and TD). Application of Schrodinger wave equations in the development of quantum physics: Problem of Particle confined in 1-D.
- Study of the Electromagnetic Waves (EM): Maxwell Equations and their application in the propagation of EM waves in free and conducting media. General discussion of Dia, Para, Ferro magnetic materials and their applications.
- Basic idea about Nano-Physics and fabrication techniques of nanoparticles, study of nanostructures as quantum well, wire and dot. The discussion on structure and application of carbon nano derivatives as.

Scope & Objective:

The branch of modern physics as quantum physics and nanoscience has opened the enormous possibilities of technological advancements. The phenomenal growth in the development and sophistication of these fields is shaping the future. Therefore, knowing about the science and possibilities of growing and emerging technologies, make the students ready to associate with some world class research institutes and present Engineering Physics course is helping considerably in this regard. The special theory of relativity and the foundations of quantum mechanics serve as the cornerstone for understanding the fabulous concepts of nature as wave particle duality of light, mass, space and time. Moreover, the Nanoscience deals with science, fabrication technology and study of nano-material as carbon based derivatives-carbon nanotubes (CNTs) and carbon nano fibres (CNFs). The present course aims at making the student learn about the basic theories, postulates and principles of modern physics as quantum physics and nanoscience and phenomenon of light waves like interference, diffraction, polarization. The emphasis is given on discussion of their applications and futuristic possibilities.

Text Book(s):

TB1 B. K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Learning, India, Ist Print 2012 TB2 H. K. Malik and A. K. Singh, "Engineering Physics", Tata Mc Graw Hill, New Delhi, …2010 TB3 N. Subrahmanyam Brijlal & M. N. Avadhanulu,"Text Book of Optics", S Chand,New Delhi24th Edition, 2012

Reference Books:

R1 Arthur Beiser, "Concepts of Modern Physics", Tata Mc Graw Hill, 6th Edition, 2003

R2 Ajoy Ghatak , "Optics", Tata Mc Graw Hill, 3rd Edition 4th reprint, 2006

R3 N. Zettili "Quantum Mechanics Concepts and Applications", Wiley, 2nd Edition, 2009

R4 David Jeffery Griffith, "Introduction to Electrodynamics", Pearson Edu. Inc., …. 2013

R5 Halliday, Resnick & Krane Booker, "Fundamentals of Physics", Wiley, 8th Edition, 2009

R6 Charles P. Poole, "Introduction to Nanotechnology", Wiley, Reprint 2009

R7 Robert Resnick , "Introduction to Special Theory of Relativity", Wiley, Reprint 2007

R8 Sears and Zemansky's, "University Physics with Modern Physics", Pearson, 12th Edition, 2009

Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference Chap./Sec. (Book)
1	Wave and particle nature of light and condition of interference	Conditions of interference, Spatial and temporal coherence	Chapter 14 (Pg 310-338) TB 3
2-3	Determination of wavelength of monochromatic light	Bi-prism experiment	Chapter 14 (Pg 310-338) TB 3
4	Interference due to division of amplitude	Interference in wedge shaped film	Chapter 15 (Pg 339-384) TB 3
5	Determination of wavelength of monochromatic light	Newton's rings	Chapter 17 (Pg 394-424) TB 3
6	Introduction to diffraction a wave phenomenon of light	Introduction, Fresnel and Fraunhofer diffraction	Chapter 18 (Pg 425-461) TB 3
7	Diffraction due to single slit	Fraunhofer diffraction at single slit	Chapter 18 (Pg 425-461) TB 3
8-9	Diffraction due to N-slit	N-slits Fraunhofer diffraction and Diffraction Grating	Chapter 18 (Pg 425-461) TB 3
10	Resolving power of grating	Rayleigh's criteria of resolution. Resolving power	Chapter 19 (Pg 462-479) TB 3
11	Introduction to laser	Spontaneous and Stimulated emission of radiation	Chapter 4 (Pg 4.1-4.13) TB 2

12	Principle of laser	Population inversion and optical pumping. Principle of laser action	Chapter 4 (Pg 4.1-4.13) TB 2
13	Working of Laser Ruby and He Ne	Construction and working of Ruby and He-Ne laser	Chapter 4 (Pg 4.1-4.13) TB 2
14	Application of laser in 3D imaging	Basic principle of holography, construction and reconstruction of image on hologram	Chapter 23 (Pg 615-622) TB 3
15		Numerical	
16	Introduction to fiber optics	Introduction to Fiber Optics, types of fiber	Chapter 5 (Pg .1-5.5) TB 2
17	Dependence of optical fiber on parameters like acceptance angle and NA	Acceptance angle and cone Numerical Aperture	Chapter 5 (Pg 5.1-5.5) TB 2
18	Polarization of light and transverse nature of light	Basic theory of double refraction, Ordinary and Extra-ordinary ray	Chapter 20 (Pg 480-536) TB 3
19-20	Production and analysis of types of polarized light	Production and detection of plane, circularly and elliptically polarized light,	Chapter 20 (Pg 480-536) TB 3
21	Optical activity and Polarimeter	Optical Activity, Specific Rotation and Polarimeters.	Chapter 20 (Pg 480-536) TB 3
22	Introduction to special theory of relativity	Inertial and non inertial frames. Galilean transformation.	Ch 1 (Pg 1-30) (R1)
23	Exp. and its negative results will help to understand the foundation of theory of relativity	Michelson- Morley experiment	Ch 1 (Pg 1-30) (R1)
24	Postulates of theory of relativity	Einstein's postulates of special theory of relativity, Lorentz transformation equations	Ch 1 (Pg 1-30) (R1)
25	Concept of length contraction and time dilation	Length contraction, Time- dilation	Ch 1 (Pg 1-30) (R1)
26	Mass energy relation	Variation of mass with velocity and mass-energy relation.	Ch 1 (Pg 1-30) (R1)
27	Mass energy relation	Mass-energy relation.	Ch 1 (Pg 1-30) (R1)
28	Describe the wave particle duality of light	Quantum theory of radiation , Wave particle duality (de-Broglie concept of matter waves).	Ch 22 (Pg 745-786) TB 1
29	Wave particle duality	Wave packet, phase velocity and group velocity (without inter relations),	Ch 22 (Pg 745-786) TB 1
30	Uncertainty in position and velocity	Heisenberg's uncertainty principle	Ch 23 (Pg 797-798) TB 1
31	Develop the mathematics required to solve a one dimensional Schrodinger equation system	Schrodinger's wave equation in three dimensions under a conservative force field, wave function and its significance,	Ch 22 (Pg 745-786) TB 1

32	Define and demonstrate real world examples of potential barrier	Eigen values and Eigen functions for particle confined in one dimensional infinite potential box	Ch 22 (Pg 745-786) TB 1
33	Analyze electric fields and magnetic fields for simple arrangements of changing electric and magnetic fields Faraday's Law and Ampere's Law	Displacement current , Three electric vectors (E, P , D,),	Ch 17 (Pg 613-633) TB 1
34-35	Concept of Magnetic materials and their properties	Magnetic vector (B, H, M) permeability, susceptibility and their relation, Basic concept of Para, Dia, and Ferro magnetism	Ch 17 (Pg 613-633) TB 1
36-37	Unify the laws of electricity and magnetism and about EM waves	Maxwell's equations in integral and differential forms.	Ch 17 (Pg 613-633) TB 1
38	Unify the laws of electricity and magnetism and about EM waves	Concept of displacement current Maxwell's Fourth equations.	Ch 17 (Pg 613-633) TB 1
39	Discuss the relationship of Maxwell's Equations to the phenomenon of light and electromagnetic radiation.	Electromagnetic wave propagation in free space	Ch 17 (Pg 613-633) TB 1
40	Concept of Nano Physics	Introduction to the field of Nano Physics, quantum wells wires and dots	Ch 19 (Pg 694-696) TB 1
41	Application of nano materials	Carbon Nano Tubes & its applications	Ch 19 (Pg 700) TB 1

Total No. of Lectures: 41

Course Outcome:

1. An ability to strengthen the scientific basis of engineering and identify, formulate and solve engineering problems especially for emerging technological applications.
2. An ability to develop fundamentals while keeping in mind the evolving nature of subjects. A strong laboratory component allows exploring a range of experiments from classic ones to those that are more recent and advanced.
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice in global, economic and social context.
4. Ability for understanding the basic knowledge of science, theories of Physics involving the various application oriented topics and improve the logical ability of thinking to solve problems required for all engineering branches.
5. An understanding through laboratory and experimental activities will help to solve problems related to key concepts taught in the classroom and accomplish a common goal.
6. Acquired knowledge will help the students in pursuing higher studies and expand professional careers in the field of Nano Science, and engineering technology. Current science and technological practice in industry and advanced research topics in the area.

Evaluation Scheme:

EC No.	Component	Duration	Marks	Weightage (%)	Date & Time	Nature
1.	Mid Term Test	2 hrs	60	30		
2.	End Term Exam	3 hrs	100	60		
3.	Assignments		50	5	See Note 1	
4.	Class test/participation		10	5	See Note 2	

Note 1: Total five assignments will be given in the entire semester (10 marks each) which will contain numerical as well as theory questions.

(i) Assignment 1 Interference

(ii) Assignment 2 Diffraction, Laser, Fiber Optics

(iii) Assignment 3 Polarization, Special Theory of Relativity

(iv) Assignment 4 Wave Mechanics

(v) Assignment 5 Electromagnetism, Nano Physics

Note 2: Two class tests will be conducted in this semester; the date will be announced subsequently in the respective classes. Out these the best performance in any one test will be considered.

Chamber Consultation Hours: Dr. Kiran Sharma: Wednesday 4-5pm and Thursday 4-5pm

Dr. Fateh Singh Gill: Monday 9-10 am and Tuesday 9-10 am

Notices: All notices concerning this course will be displayed on the Physics Department Notice Board and will also be available in the B. Tech Ist year web-site. www.btechgeu.in