Course Syllabus

Gyanmanjari Institute of Technology
Semester- II

Subject: -Physics - BETXX10205

Type of course: Minor Stream

Prerequisite: Basic Physics, understanding of Semiconducting Materials, different states of Materials.

Rationale:

Physics is a branch of science mainly dealing with interaction of energy and matter and considered as the mother of all engineering disciplines. Degree engineers (technologists) have to deal with various materials while using/ maintaining machines. Moreover, the basic knowledge of principles of physics helps degree students to lay foundations of core engineering courses. The laws and principles of physics, formulae and knowledge of physical phenomena and physical properties provide a means of estimating the behavior of things before we design and observe them. This course of physics has been designed as per program requirements to help students to study the relevant core engineering courses. The complicated derivations have been avoided. This course will help the degree engineers to use/apply the basic concepts and principles of physics, solve well designed engineering problems and comprehend different technology based applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	-	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Physics affairs** Students have to prepare a report on current Physics affairs in 150 words (as per format) and upload it to GMIU Web Portal.	10
2	**Prepare a chart** Faculty will provide a list of instrument and students will prepare a chart on function or characteristics or application of the instrument and upload it to GMIU web Portal.	10
3	**Magic of Physics** Faculty will provide a list of tricks based on principle of physics and a group of students (Two students in one group) or individual will learn and prepare a video of the trick performance and upload it to GMIU web Portal.	10
Total		30

Course Content:

Sr. No	Course content	Hrs	% Weightage
1	**Chapter: 1 Semiconductors** Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, (equilibrium carrier statistics) Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.	13	25 %
2	**Chapter: 2 Superconductivity** Introduction of Superconductivity, Properties of superconductor, Effect of magnetic field, Meissner effect, Pressure effect, Impurity effect, Isotopic mass effect, Mechanism of Superconductivity: BCS Theory, Penetration depth: Magnetic field, Josephson's junction and its application, Application of superconductors.	10	25 %

3	**Chapter: 3 Waves, Ultrasonic and Non destructive testing (NDT)** Types of waves, wave motion, Wave Equation, transverse and longitudinal vibration, Ultrasonic waves Properties of ultrasound, Production of ultrasonic waves: Piezoelectric and magnetostriction method, Detection of ultrasound, Application of ultrasound, Introduction of NDT, Advantages of NDT, NDT through ultrasound.	12	25 %
4	**Chapter: 4 LASER** Properties of Laser Einstein's theory of matter radiation: A and B coefficients, Amplification of light by population inversion, Different types of lasers, gas lasers (He-Ne) solid-state lasers(ruby), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles Applications of lasers in science, engineering and medicine.	10	25 %

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	35%	35%	0	0	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Design properties associated with semiconducting materials.
CO2	Analyze the superconducting state and applications of Superconductivity.
CO3	Solve the problems based on principles and properties of Waves and wave motion.
CO4	Apply principles, properties and application of Lasers.

List of Practical

Sr. No	Descriptions	Unit No	Hrs
1	To study the I-V Characteristics of Silicon diode.	1	2
2	To study the I-V Characteristics of Zener diode.	1	2
3	To study the I-V Characteristics of LED.	1	2
4	To study Zener diode inLine regulation as voltage regulator.	1	2
5	To study Zener diode in Load regulation as voltage regulator.	1	2
6	To determine the voltage factor and field factor of a solar cell.	1	2
7	To determine the open circuit voltage, short circuit current and Efficiency of a given solar cell.	3	2
8	Calibration of Spectrometer & determination of unknown wavelength.	3	2
9	To determine the wavelength of a monochromatic light source using Newton's rings method.	3	2
10	Study of Object Detection using Ultrasonic Sensors.	3	4
11	To measure the numerical aperture of optical fiber by using LASER.	4	2
12	To determine the frequency of a given laser source.	4	2
13	Wavelength of Light -Diffraction GratingUsing LASER	4	4
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] Engineering Physics by Shatendra Sharma &Jyotsan Sharma, Pearson Publication.
[2] Engineering Physics by Dattu R Joshi, McGraw hill Publications.
[3] Semiconductor Optoelectronics: Physics and Technology by I. J. Singh, McGraw-Hill Inc. (1995).
[4] Fundamentals of Photonics, by B. E. A. Saleh and M. C. Teich, John Wiley & Sons, Inc.,(2007).
[5] Semiconductor Devices: Physics and Technology, by S. M. Sze, Wiley (2008).
[6] Photonics: Optical Electronics in Modern Communications, by A. Yariv and P. Yeh, Oxford.