DRAFT SYLLABUS
ENGINEERING PHYSICS

(Common to all Branches)
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-22)

Course Code : 21PHY12/22
Teaching Hours/Week (L:T:P:S) : 2:1:0:0
Contact Hours/Week : 03
Total Hours: 40
Semester: I/II

CIE Marks : 50
SEE Marks: 50
Total Marks : 100
Exams. Hours: 03
Credits: 03

Course Learning Objectives: This course (21PHY12/22) will enable students to

- Learn the basic concepts in Physics which are very much essential in understanding and solving engineering related challenges.
- Gain the knowledge of newer concepts in modern physics for the better appreciation of modern technology.

MODULE - 1

Oscillations and Waves

Free Oscillations : Definition of SHM, derivation of equation for SHM, Mechanical and electrical simple harmonic oscillators (mass suspended to spring oscillator with series and parallel.combination).

Damped and forced oscillations : Differential equation of damped oscillations and mention its general solution : over damping, critical & under damping, quality factor. Theory of forced oscillations and resonance, sharpness of resonance.

Shock Waves : Mach number, Shock Waves. Statement of Laws of conservation of mass, energy and momentum. Construction and working of Reddy shock tube, Characteristics of Reddy shock tube, applications of shock waves.

Numerical Problems. **08 - Hours**

MODULE - 2

Elastic Properties of Materials :

Elasticity : Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress, compressive stress, Hooke's Law, different elastic moduli, Poisson's ratio, Expression for Young's modulus (Y), Bulk modulus (K) &Rigidity modulus (n) in terms of α & β.

Bending of beams : Derivation of expression for bending moment, Single Cantilever, derivation of expression for Young's modulus.

Torsion of Cylinder : Expression for couple per unit twist of a solid cylinder (Derivation), Torsional pendulum – Expression for period of oscillation.

Numerical Problems. **08 - Hours**

MODULE – 3

Electromagnetism and Quantum Mechanics

Maxwell's equation : Fundamentals of vector calculus, divergence & curl of electric field & magnetic field (static), Gauss divergence theorem & Stoke's theorem.

Role of Dielectrics : Dielectrics, Mention of solid, liquid & gaseous dielectrics with one example each. Application of dielectrics in transformers.

Quantum Mechanics : Heisenberg uncertainty principle, applications (non-existence of electron in the nucleus), wave function, properties of wave function, time independent Schrodinger wave equation, particle in box, eigen values, eigen functions

Numerical Problems.

08 – Hours

MODULE – 4

Materials Science

Electrical conductivity in metals : Free electron concept (mean free path, mean collision time, drift velocity, relaxation time), assumptions of classical free electron theory, Mention the expression for electrical conductivity for classical free electron theory , failures of classical free electron theory. Assumptions of quantum free electron theory, expression for electrical conductivity for quantum free electron theory, success of quantum free electron theory, Fermi energy, Fermi factor, dependence of Fermi factor on temperature

Semiconductor Physics : Expression for electrical conductivity in intrinsic semiconductor, Hall effect

Nanomaterials : Introduction to Nanomaterials and Quantum structures (0-D, 1-D, 2-D).

Characterization Techniques : Principle, Construction and Working of X-ray diffractometer (XRD), Scanning Electron Microscopy (SEM).

Numerical Problems.

08 - Hours

MODULE – 5

Lasers and Optical Fibers

Lasers : Principles of lasers, Einstein's coefficients (derivation of expression for energy density). Requisites of laser system. Conditions for laser action. Construction & working of CO_2 & Semiconductor laser. Applications of laser in defence (Laser range finder) & Engineering (data storage).

Optical Fibers : Propogation Mechanism, angle of acceptance. Numerical aperture. Modes of Propagation & types of optical fibers, attenuation mechanisms, attenuation coefficient (qualitative), discussion of block diagram of point to point of communication system.

Numerical Problems. **08 - Hours**

Course Outcomes:

Upon completion of this course, students will be able to

1. Understand various types of oscillations and their implications, the role of Shock waves in various fields and recognize the elastic properties of materials for engineering applications.
2. Realize the interrelation between time varying electric field and the transverse nature of the EM waves and their role in optical fiber communication.
3. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent 1-D Schrodinger's wave equation.
4. Apprehend theoretical background of laser, construction and working of different types of laser and its applications in different fields.
5. Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.

Pedagogy (General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills in physics.
2. State the necessity of physics in engineering studies and offer real life examples.
3. Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
4. Encourage the students for group learning to improve their creativity and analytical skills.
5. While teaching show how every concepts can be applied to the real world. This helps the students to expand understanding level.
6. Support and guide the students for self-study.
7. Ask some higher order thinking questions in the class, which promotes critical thinking. 8. Inspire the students towards the studies by giving new ideas and examples

Question paper pattern:

Note: -

- The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question consisting of 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand & Company Ltd, New Delhi.
2. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017.
3. Concepts of Modern Physics-Arthur Beiser: 6 th Ed;Tata McGraw Hill Edu Pvt Ltd-New Delhi 2006.
4. X-ray diffraction- B.E Warren published by Courier Corporation.
5. Nano Composite materials- Synthesis, properties and applications, CRC Press.

Reference books:

1. Introduction to Mechanics — MK Verma: 2nd Ed, University Press(India) Pvt Ltd, Hyderabad 2009
2. Lasers and Non Linear Optics – BB laud, 3rd Ed, New Age International Publishers 2011
3. Solid State Physics-S O Pillai, 8th Ed- New Age International Publishers-2018
4. Shock waves made simple- Chintoo S Kumar, K Takayama and KPJ Reddy: Willey India Pvt. Ltd. New Delhi2014
5. Introduction to Electrodynamics- David Griffiths: 4th Ed, Cambridge University Press 2017
6. Characterization of Materials- Mitra P.K. Prentice Hall India Learning Private Limited
7. Materials Characterization Techniques- Sam zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008

DRAFT SYLLABUS

ENGINEERING PHYSICS LAB

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the Academic Year 2021-22)

Course Code : 21PHYL16/26
Teaching Hours/Week : 02
Total Hours:30
Semester: I/II

CIE Marks : 50
SEE Marks: 50
Exams. Hours: 03
Credits: 01

Course Learning Objectives:

This course (21PHYL16/26) will enable students

- To realize experimentally, the mechanical, electrical and thermal properties of materials, concept of waves and oscillations
- To design simple circuits and hence study the characteristics of semiconductor devices

Experiment:

Module-1

1. Determination of spring constants in Series and Parallel combination.
2. Study Series and parallel LCR resonance and hence Calculate inductance, band width and quality factor using series LCR Resonance.

Module-2

3. n & I by Torsional pendulum (radius of the wire, mass and dimensions of the regular bodies to be given).
4. Young's modulus of a beam by Single Cantilever experiment.

Module-3

5. Calculation of Dielectric constant by RC charging and Discharging.
6. Stefan's Law of radiation.
7. Determination of Planck's constant using Light Emitting Diodes.

Module-4

8. Determina Estimation of Fermi Energy of Copper.
9. Study of input and output Transistor characteristics and hence calculate input resistance, and output resistance .

Module-5

10. Determine Acceptance angle and Numerical aperture of an optical fiber.
11. Determine Wavelength of semiconductor laser using Laser diffraction by calculating grating constant.

12. Draw I-V characteristics of photodiode and calculate power responsivity.
13. Young's modulus by uniform bending.

Note: Any 10 experiments are mandatory. Student has to perform 2 experiments in the semester end examination

Course Outcomes:

Upon completion of this course, students will be able to

1. Apprehend the concepts of interference of light, diffraction of light, Fermi energy and magnetic effect of current
2. Understand the principles of operations of optical fibers and semiconductor devices such as Photodiode, and NPN transistor using simple circuits
3. Determine elastic moduli and moment of inertia of given materials with the help of suggested procedures
4. Recognize the resonance concept and its practical applications
5. Understand the importance of measurement procedure, honest recording and representing the data, reproduction of final results

Web links and Video Lectures (e-Resources):

https://www.britannica.com/technology/laser,k

https://nptel.ac.in/courses/115/102/115102124/

https://nptel.ac.in/courses/115/104/115104096/

http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
https://onlinecourses.nptel.ac.in/noc20_mm14/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning :

http://nptel.ac.in https://swayam.gov.in

https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham

Sharnbasva University, Kalaburagi
Scheme of Teaching and Examination 2021-22
Outcome Based Education(OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021-22)
I / II SEMESTER B.Tech (Physics Group)

Sl.No	Course Code	Course Title	Teaching Dept. & Paper Setting Board	Teaching Hours/week				Examination				Credits
				Theory Lecture	Tutorial	Practical/Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	21PHY12/22	Engineering Physics	Physics	2	1	---	---	3	50	50	100	03
2	21PHYL16/26	Engineering Physics Lab	Physics	---	--	2	---	3	50	50	100	01
Total				**2**	**1**	**2**		**6**	**100**	**100**	**200**	**04**

Date :- 28/11/2021

A meeting of Board of Studies (BOS) is conducted
(1) Finalization of the choice based credit scheme (CBCS) for the under graduate course.
(2) Finalization of Syllabus and scheme of Engineering Physics (Theory and Lab). for I and II Semester.
(3) Finalization of Syllabus and scheme of PhD in Physics coursework.
on 28/11/2021 at 11:00 AM in University meeting Hall, Main building, Sharnbasva University, Kalaburagi.

The following members were present in the meeting.

Internal member

(1)	Dr. Anilkumar Bidve	chairman	
(2)	Dr. Nagbasvanna Guragol	Member	

External member

(1)	Dr. M.V.N. Ambika Prasad	Member	
(2)	Dr. Bharat Kumar	Member	
(3)	Dr. Vijaylaxmi Reddy	Member	
(4)	Dr. Siddlingeshwar. B.	Member	
(5)	Revanasiddappa	Member	
(6)	Prof. Shivleela Wadankeri	Member	
(7)	Prof. Praveen. B. chouri	Member	

The meeting resolved to accept the scheme and evaluation and Syllabus propored the department of Physics, Faculty of Science and Technology, Sharnbasva University, Kalaburagi.

CHAIRMAN (BoS)
Department of P.G. Studies in Physics
Faculty of Science & Technology
Sharnbasva University, Kalaburagi.