Ref No:

Sri Krishna Institute of Technology, Bengaluru

COURSE PLAN

Academic Year 2019-20

Program:	B E
Semester :	1
Course Code:	18PHY12
Course Title:	Engineering Physics
Credit / L-T-P:	4 / 3-2-0
Total Contact Hours:	50
Course Plan Author:	Dr. Savita B Hosur

Academic Evaluation and Monitoring Cell

Hesaraghatta Main Road
Chikkabanavara – 560090, Karnataka, India
08023721477 / Fax :+91-080-23721315
Web: www.skit.org , e-mail: skitprinci1@gmail.com

Table of Contents

Note : Remove “Table of Content” before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	All
Year / Semester :	2019 / 1	Academic Year:	2019-2020
Course Title:	Engineering Physics	Course Code:	18PHY12
Credit / L-T-P:	3-2-0	SEE Duration:	180 Minutes
Total Contact Hours:	50	SEE Marks:	60 Marks
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	Dr. Savita B. Hosur	Sign	Dt:

Checked By:	Prof. Ravi S	Sign ..	Dt:
CO Targets	CIA Target : 80 %	SEE Target:	70 %

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	Definition of SHM, Characteristics, Examples and Derivation of differential equation of motion for SHM starting from Hooke's law and mention its solution. Mechanical simple harmonic oscillator: Mass suspended to spring (vertical vibrations) - Description, Mention of Expression for time period/frequency, Definition of force constant and its significance, Derivation of expressions for force constants for series and parallel combination of springs. Complex notation of simple harmonic motion (Aei(ωt + ε)), Phasor representation of simple harmonic motion. Theory of damped oscillations (over damping critical and under damping) forced oscillations and resonance, sharpness of resonance. Example for mechanical resonance. Mach number, properties of shock waves, control volume. Laws of conservation of mass, energy and momentum. Construction and working of Reddy shock tube. Applications. Numerical Problems	10	Oscillations and waves	Understand L2, Analyze L4
2	Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress, compressive stress, strain hardening and strain softening, failure. Hooke's law, Poison's ratio, Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n). Relation between Y, K & n. Limits of Poisson's ratio. Neutral surface and Neutral Plane, derivation of expression for bending moment. Bending momentum of a beam with circular and rectangular cross section. Single cantilever. Expression for couple per unit test of a solid cylinder (Derivation), Torsional Pendulum. Numerical problems.	10	Elasticity and Torque	L4-Analyze
3	Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum. The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves (Qualitative). Propagation mechanism, angle of acceptance. Numerical aperture. Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and Mention of expression for attenuation coefficient. Discussion of block diagram of point to point communication. Merits and demerits Numerical problems	10	Electric and magnetic field, TIR	L4 - Analyze
4	Introduction to Quantum mechanics, Wave nature of particles,	10	Heisenberg's uncertainty,	L4 -

	Heisenberg's uncertainty principle and applications (non confinement of electron in the nucleus), Schrodinger time independent wave equation, Significance of Wave function, Normalization, Particle in a box, Energy eigen values of a particle in a box and probability densities. Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of CO2 and semiconductor Lasers. Application of Lasers in Defense (Laser range finder) and Engineering (Data storage). Numerical problems		Interaction of Radiation with matter	Analyze
5	Review of classical free electron theory, mention of failures. Assumptions of Quantum Free electron theory, Mention of expression for density of states, Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level, Derivation of the expression for Fermi energy, Success of QFET. Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression), Conductivity of semiconductors(derivation), Hall effect, Expression for Hall coefficient(derivation) polar and non-polar dielectrics, internal fields in a solid, Clausius - Mossotti equation (Derivation), mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers. Numerical problems	10	Free electron Theory, Materials	L4 - Analyze
-	**Total**	**50**	**-**	**-**

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).
1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
	A Text book of Engineering Physics – M. N. Avadhanulu and P. G. Kshirsagar, S Chand & Co., 10th Revised Ed	1,10,20, 24	In Lib
1-5	Engineering Physics – Gaur and Gupta, Dhanpat Rai Publications - 2017	2, 4 1-10	In Lib/ In dept
	Engineering Physics – S. P. Basavaraju, Subash Publications - 2018		
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2	Introduction to Mechanics – M. K. Verma, 2nd Ed, University Press,		In Lib
3,4	Laser and Non Linear Optics – B B Laud, 3rd Ed., New age international publishers		In Lib
5	Solid State Physics – S. O. Pillai, 8th Ed., New age international publishers	5,6,10,11	In lib
C	**Concept Videos or Simulation for Understanding**	**-**	**-**

C1 - C10	• Basic Physics: https://www.physicsclassroom.com • Elasticity:https://www.youtube.com/watchv=OAK7CZSu9DA • Quantum Mechanics: NPTEL: https://www.youtube.com/watch?v=pGerRhxNQJE		web
D	**Software Tools for Design**	**-**	**-**
E	**Recent Developments for Research**	**-**	**-**
F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**
1	NPTEL		

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

SNo	Course Code	Course Name	Module / Topic / Description	Sem	Remarks	Blooms Level
1	18PHY12	Engineering Physics	Oscillations and Waves	Lower Standards	Knowledge of Motion, vibrations, conservation laws	L1, L2
2	18PHY12	Engineering Physics	Elastic Properties of Materials	Lower Standards	Size, Shape of materials, Application of forces	L1, L2
3	18PHY12	Engineering Physics	Maxwell's equations, EM waves and Optical Fibers	Lower Standards	Study of Vector, Scalar, Electromagnetic waves	L2
4	18PHY12	Engineering Physics	Quantum Mechanics and Lasers	Lower Standards	Understanding of Classical Physics, Emission and absorption processes	L2
5	18PHY12	Engineering Physics	Material Science	Lower Standards	Band theory of Solids, Conductivity in Semiconductors	L1, L2

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Modules	Course Code.#	Course Outcome At the end of the course, student should be able to . . .	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	CO1	Students should be able to... Understand the types of oscillations and their implications.	06	Oscillations	Lecture, PPT, Classroom Expt.	Slip Test	L2 Understand
1	CO2	Illustrate production of shock waves by using waves in Reddy Shock tube	04	Shock waves	Lecture, PPT	Slip Test	L4 Illustrate
2	CO3	Analyze the elastic properties of materials for engineering field using Hook's Law and Possions' ratio.	07	Elasticity	Lecture, PPT, Classroom Expt.	Slip Test	L4 Analyze
2	CO4	Calculate the couple per unit twist of a solid cylinder and period of oscillations for Torsional pendulum.	03	Torque	Lecture, PPT, Classroom Expt.	Slip Test	L3 Analyze
3	CO5	Analyze the Maxwell's equation by using EM waves.	06	Electric and Magnetic field	Lecture, PPT, Classroom Expt.	Slip Test	L4 Analyze
3	CO6	Illustrate the point to point communication using optical fibers.	04	Total internal reflection	Lecture, PPT, Classroom Expt.	Slip Test	L4 Illustrate
4	C07	Compute the Eigen values and eigen function by using the time independent 1D Schrodinger wave equation	05	Heisenberg's Uncertainty Principle	Lecture, PPT	Slip Test	L4 Compute
4	CO8	Analyze the production and applications of laser.	05	Interaction of radiation with matter	Lecture, PPT, Classroom Expt.	Slip Test	L4 Analyze
5	CO9	Analyze the electrical and thermal properties of conductor using Quantum theory.	04	Free electron theory	Lecture, PPT	Slip Test	L4 Analyze
5	CO10	Analyze the electrical conductivity of semiconductors using band theory of solids.	06	Material Physics	Lecture, PPT,	Slip Test	L4 Analyze
-		Total	50	-	-	-	-

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area	CO	Level
1	Understand the car shock absorbers and musical instruments.	CO1	L2

2	Analyze the concrete structures.	CO2	L4
3	Analyze the materials in mechanical engineering.	CO3	L4
4	Analyze the civil engineering structural elements.	CO4	L3
5	Analyze the EM communication and wireless communication.	CO5	L4
6	Used in the medical field, communication system.	CO6	L4
7	Used in materials engineering, photonics, MRI.	CO7	L4
8	Used in medical field, communication, Industry applications.	CO8	L4
9	Used in electrical and electronics engineering.	CO9	L4
10	Design of active electronic components.	CO10	L4

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Modules	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	CO	PO	-	'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'	-
1	CO1	PO1	3	Engineering Knowledge: Acquisition of Engineering Knowledge of oscillation is required to accomplish the study of engineering subjects	L2 Understand
1	CO1	PO2	3	Problem Analysis: Analyzing problems require knowledge of Identifying the oscillations in mechanical and electrical oscillators.	L2 Understand
1	CO1	PO3	3	Design and development of Solutions: Designing of shock absorbers for vehicles requires the knowledge of oscillations.	L2 Understand
1	CO1	PO4	3	Conduct investigations of complex problems: Investigation of new designs of shock absorbers require knowledge of oscillations.	L2 Understand
1	CO1	PO5	2	Modern tool Usage: The modern tools help to understand the types of oscillation and their limitations.	L2 Understand
1	CO1	PO6	-	No Mapping – This learning is not relevant with societal, health, safety, legal and cultural issues.	L2 Understand
1	CO1	PO7	-	No Mapping – This learning does not have any impact on society environmental contexts.	L2 Understand
1	CO1	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L2 Understand
1	CO1	PO9	3	Individual and Team work: The knowledge oscillation is required to do mini projects on different types of oscillators.	L2 Understand
1	CO1	PO10	-	No Mapping – No design documentation activity with engineering community.	L2 Understand
1	CO1	PO11	-	No Mapping – There is no finance management involved.	L2 Understand
1	CO1	PO12	3	Life long learning: The study of Oscillations is applicable to the technology and Life long learning in industry.	L2 Understand
1	CO2	PO1	3	Engineering Knowledge: Acquisition of Engineering knowledge of Shock waves required to study shock wave tube	L4 Illustrate
1	CO2	PO2	3	Problem Analysis: The knowledge of analyzing the waves requires	L4

				to study the speed of Aircrafts.	Illustrate
1	CO2	PO3	3	Design and development of solutions: Designing of building structures and aircraft requires the knowledge of waves.	L4 Illustrate
1	CO2	PO4	3	Conduct investigations of complex problems: To conduct the investigation of new designs of aircraft requires the knowledge of waves.	L4 Illustrate
1	CO2	PO5	2	Modern tool usage: To understand the principle of shock waves with limitation.	L4 Illustrate
1	CO2	PO6	2	The Engineer and Society: The study of waves and its properties help in the development of society.	L4 Illustrate
1	CO2	PO7	2	Environment and sustainability: The study of shockwaves and its application help in the development of the society and Nation.	L4 Illustrate
1	CO2	PO8	-	No Mapping – The content is not related to professional ethics norms and practice	L4 Illustrate
1	CO2	PO9	3	Individual and Team work: The study of Experiments on production of shock waves can be done individually or in a team.	L4 Illustrate
1	CO2	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Illustrate
1	CO2	PO11	-	No Mapping – There is no finance management involved.	L4 Illustrate
1	CO2	PO12	-	No Mapping - No independent learning.	L4 Illustrate
2	CO3	PO1	3	Engineering Knowledge: The knowledge of elasticity required to understand different concepts in civil and mechanical engineering field.	L4 Analyze
2	CO3	PO2	3	Problem Analysis: The problem analyzing knowledge on elasticity is required to analyse different materials.	L4 Analyze
2	CO3	PO3	3	Design and Development of solution: The knowledge of designing and development Designing of bridges and monuments.	L4 Analyze
2	CO3	PO4	-	No Mapping – There is no investigation.	L4 Analyze
2	CO3	PO5	-	No mapping - No tool content.	L4 Analyze
2	CO3	PO6	-	No Mapping – This learning is not relevant with societal, health, safety, legal and cultural issues.	L4 Analyze
2	CO3	PO7	-	No Mapping – This learning does not have any impact on society environmental contexts.	L4 Analyze
2	CO3	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L4 Analyze
2	CO3	PO9	3	Individual and Team work: Study of Experiments on determining different moduli of the materials requires individual /Team work.	L4 Analyze

2	CO3	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Analyze
2	CO3	PO11	-	No Mapping – There is no finance management involved.	L4 Analyze
2	CO3	PO12	3	Life long learning – The study of elastic properties involves life long learning of the concepts.	L4 Analyze
2	CO4	PO1	3	Engineering Knowledge: Engineering knowledge of torque is required in study in motion of the body	L3 Analyze
2	CO4	PO2	3	Problem Analysis: The Problem analyzing technique using the knowledge of torque is required in analyzing the mechanism in electric motors.	L3 Analyze
2	CO4	PO3	3	Design and Development of solution: The knowledge of designing is required to develop the solution for the setup to study torsional oscillations.	L3 Analyze
2	CO4	PO4	3	No Mapping – There is no investigation.	L3 Analyze
2	CO4	PO5	-	No mapping - No tool content.	L3 Analyze
2	CO4	PO6	-	No Mapping – This learning is not relevant with societal, health, safety, legal and cultural issues.	L3 Analyze
2	CO4	PO7	-	No Mapping – This learning does not have any impact on society environmental contexts.	L3 Analyze
2	CO4	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L3 Analyze
2	CO4	PO9	3	Individual and Team work: The study of rigidity modulus using torsional pendulum Experiment requires the Individual / Team work.	L3 Analyze
2	CO4	PO10	-	No Mapping – No design documentation activity with engineering community.	L3 Analyze
2	CO4	PO11	-	No Mapping – There is no finance management involved.	L3 Analyze
2	CO4	PO12	-	No Mapping - No independent learning.	L3 Analyze
3	CO5	PO1	3	Engineering Knowledge: The engineering knowledge of electrical and magnetic field in required in the study of Maxwell's equation.	L4 Analyze
3	CO5	PO2	3	Problem Analysis: The knowledge of EM field is required in analyzing the problems in communication system.	L4 Analyze
3	CO5	PO3	3	Design and Development of solution: The Design and development of solutions for various electro magnetic waves requires the knowledge using Maxwell's Equation.	L4 Analyze
3	CO5	PO4	3	Conduct Investigations of Complex Problems: The investigations of Analysis and interpretation of Maxwell's equation requires the knowledge electromagnetic wave theory.	L4 Analyze
3	CO5	PO5	-	No mapping - No tool content.	L4 Analy

					ze
3	CO5	PO6	-	No Mapping – This learning is not relevant with societal, health, safety, legal and cultural issues.	L4 Analyze
3	CO5	PO7	-	No Mapping – This learning does not have any impact on society environmental contexts.	L4 Analyze
3	CO5	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L4 Analyze
3	CO5	PO9	-	No Mapping – No projects involved.	L4 Analyze
3	CO5	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Analyze
3	CO5	PO11	-	No Mapping – There is no finance management involved.	L4 Analyze
3	CO5	PO12	-	No Mapping - No independent learning.	L4 Analyze
3	CO6	PO1	3	Engineering Knowledge: The engineering knowledge of TIR is required in the study of optical fiber communication system.	L4 Analyze
3	CO6	PO2	3	Problem Analysis: The Problem analyzing in Optical fiber communication require the knowledge of TIR	L4 Analyze
3	CO6	PO3	3	Design and Development of solution: The knowledge of Optical fibers is required to design Point to point communication system.	L4 Analyze
3	CO6	PO4	3	Conduct Investigations of complex problems: Various investigation on the experimental setup on study of Acceptance angle and Numerical aperture of the fiber requires the knowledge of Optical fibers properties.	L4 Analyze
3	CO6	PO5	-	No tool content. No mapping.	L4 Analyze
3	CO6	PO6	-	The engineer and Society: The knowledge of Optical fibers is used in communication for societal safety issues.	L4 Analyze
3	CO6	PO7	-	Environment and Sustainability: The study of optical fibers helps in development of the communication system in society.	L4 Analyze
3	CO6	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L4 Analyze
3	CO6	PO9	3	Individual and Team Work: The study of different properties of optical fibers by different lab experiments requires the Individual and Team work.	L4 Analyze
3	CO6	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Analyze
3	CO6	PO11	-	No Mapping – There is no finance management involved.	L4 Analyze
3	CO6	PO12	3	Life Long Learning: The study of optical fibers is a Life long learning in day to day technological application.	L4 Analyze

4	CO7	PO1	3	Engineering Knowledge: Acquisition of engineering Knowledge of HUP is required to calculate the Eigen energy values	L4 Analyze
4	CO7	PO2	3	Problem Analysis: Analyzing problems on atomic structure requires the knowledge knowledge of Heisenberg uncertainty principle and Eigen values .	L4 Analyze
4	CO7	PO3	3	Design and Development of solution: Analyzing the processes of Einstein's energy values & Heisenberg uncertainty principle.	L4 Analyze
4	CO7	PO4	-	No Mapping – There is no investigation.	L4 Analyze
4	CO7	PO5	-	No tool content. No mapping.	L4 Analyze
4	CO7	PO6	-	No Mapping – This learning is not relevant with societal, health, safety, legal and cultural issues.	L4 Analyze
4	CO7	PO7	-	No Mapping – This learning does not have any impact on society environmental contexts.	L4 Analyze
4	CO7	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L4 Analyze
4	CO7	PO9	-	No project involved. No mapping.	L4 Analyze
4	CO7	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Analyze
4	CO7	PO11	-	No Mapping – There is no finance management involved.	L4 Analyze
4	CO7	PO12	-	No Mapping - No independent learning.	L4 Analyze
4	CO8	PO1	3	Engineering Knowledge: The acquisition of engineering knowledge of Interaction of radiation with matter is required in the study of communication system.	L4 Analyze
4	CO8	PO2	3	Problem Analysis: Analysing problem requires the knowledge of understanding of interaction of radiation with matter to accomplish the understanding of CO_2 and semiconductor lasers.	L4 Analyze
4	CO8	PO3	3	Design and Development of solution: The design and development of solution for designing the laser production techniques.	L4 Analyze
4	CO8	PO4	3	Conduct Investigations of complex problems: The knowledge to analyze the production and applications is required to solve the complex problems.	L4 Analyze
4	CO8	PO5	2	Modern tool usage: The modern tool usage is required to analyze the types of Lasers with an understanding of limitations in applications.	L4 Analyze
4	CO8	PO6	2	The engineer and society: The knowledge of Laser radiation effects in health issues in the society.	L4 Analyze
4	CO8	PO7	2	Environment and sustainability: Analyzing and understanding the knowledge of laser radiation impact on environment and its sustainability.	L4 Analyze
4	CO8	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L4 Analy

					ze
4	CO8	PO9	3	Individual and Team work: Study of experiment on production of laser requires the Individual and Team work.	L4 Analyze
4	CO8	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Analyze
4	CO8	PO11	-	No Mapping – There is no finance management involved.	L4 Analyze
4	CO8	PO12	3	Life long learning: The life long learning of Laser applications is essential in day to day applications.	L4 Analyze
5	CO9	PO1	3	Engineering Knowledge: The acquisition of Engineering knowledge of of free electron theory is required to understand electrical and thermal properties of materials.	L4 Analyze
5	CO9	PO2	3	Problem Analysis: The problem analysis of analyzing the material properties and structure requires the knowledge of free electron theory.	L4 Analyze
5	CO9	PO3	3	Design and Development of solution: Design and development of solution is required to analyze the process of conductivity in conductor.	L4 Analyze
5	CO9	PO4	-	No Mapping – There is no investigation.	L4 Analyze
5	CO9	PO5	-	No tool content. No mapping.	L4 Analyze
5	CO9	PO6	-	No Mapping – This learning is not relevant with societal, health, safety, legal and cultural issues.	L4 Analyze
5	CO9	PO7	-	No Mapping – This learning does not have any impact on society environmental contexts.	L4 Analyze
5	CO9	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L4 Analyze
5	CO9	PO9	3	Individual and Team work: The individual and Team work is required to demonstrate the lab experiments on Fermi energy.	L4 Analyze
5	CO9	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Analyze
5	CO9	PO11	-	No Mapping – There is no finance management involved.	L4 Analyze
5	CO9	PO12	-	No Mapping - No independent learning.	L4 Analyze
5	CO10	PO1	3	Engineering Knowledge: The acquisition of engineering knowledge of band theory of solids is required in understanding the function of different devices.	L4 Analyze
5	CO10	PO2	3	Problem analysis: Analyzing problems require the knowledge of Identifying the different materials using band theory of solids.	L4 Analyze
5	CO10	PO3	3	Design and Development of solution: The design and development of solution is required to analyze the process of conductivity in semiconductor.	L4 Analyze
5	CO1	PO4	3	Modern tool usage: The Modern tool usage is required in analysis	L4

	0			of semiconductors on doping concentration.	Analyze
5	CO10	PO5	-	No tool content. No mapping.	L4 Analyze
5	CO10	PO6	-	No Mapping – This learning is not relevant with societal, health, safety, legal and cultural issues.	L4 Analyze
5	CO10	PO7	-	No Mapping – This learning does not have any impact on society environmental contexts.	L4 Analyze
5	CO10	PO8	-	No Mapping – The content is not related to professional ethics norms and practice.	L4 Analyze
5	CO10	PO9	3	Individual and Team work: To demonstrate the semiconductor lab experiments like Photo diode and Transistor requires the Individual and team work.	L4 Analyze
5	CO10	PO10	-	No Mapping – No design documentation activity with engineering community.	L4 Analyze
5	CO10	PO11	-	No Mapping – There is no finance management involved.	L4 Analyze
5	CO10	PO12	-	No Mapping - No independent learning.	L4 Analyze

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes														-
Modules	CO.#	At the end of the course student should be able to . . .	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	CO1	Understand the types of oscillations and their implications.	√	√	√	√	√				√			√				L2
1	CO2	Illustrate production of shock waves by using waves in Reddy Shock tube	√	√	√	√	√	√	√		√							L2
2	CO3	Analyze the elastic properties of materials for engineering field using Hook's Law and Possions' ratio.	√	√	√						√			√				L2
2	CO4	Calculate the couple per unit twist of a solid cylinder and period of oscillations for Torsional pendulum.	√	√	√						√							L3
3	CO5	Analyze the Maxwell's equation by using EM waves.	√	√	√	√												L2
3	CO6	Illustrate the point to point communication using optical fibers.	√	√	√	√		√	√		√			√				L2
4	C07	Compute the Eigen values and eigen function by using the time independent 1D Schrodinger wave equation	√	√	√													L3

4	CO8	Analyze the production and applications of laser.	√	√	√	√	√	√	√		√			√				L2
5	CO9	Analyze the electrical and thermal properties of conductor using Quantum theory.	√	√	√						√							L2
5	CO10	Analyze the electrical conductivity of semiconductors using band theory of solids.	√	√	√	√					√							L3
-	**CS501PC**	**Average attainment (1, 2, or 3)**																**-**
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*																

5. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

6. Content Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Oscillations and Waves	10	2	-	-	1	1	2	CO1, CO2	L2, L3,L4
2	Elastic Properties of Materials	10	2	-	-	1	1	2	CO3, CO4	L2, L3,L4
3	Maxwell's Equation, EM waves and Optical Fibers	10	-	2	-	1	1	2	CO5, CO6	L2, L3,L4
4	Quantum Mechanics and Lasers	10	-	2	-	1	1	2	CO7, C08	L2, L3,L4
5	Quantum Free electron theory, Physics of semiconductors and Dielectric materials	10	-	-	4	1	1	2	CO9, CO10	L2, L3,L4
-	**Total**	**50**	**4**	**4**	**4**	**5**	**5**	**10**	**-**	**-**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
4,1	CIA Exam – 1	30	CO1, CO2, CO3, CO4	L2, L3,L4
2,3	CIA Exam – 2	30	CO5, CO6, CO7, C08	L2, L3,L4
5	CIA Exam – 3	30	CO9, CO10	L2, L3,L4
4,1	Assignment - 1	10	CO1, CO2, CO3, CO4	L2, L3,L4
2,3	Assignment - 2	10	CO5, CO6, CO7, C08	L2, L3,L4
5	Assignment - 3	10	CO9, CO10	L2, L3,L4
	Final CIA Marks	**40**	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	Oscillations and Waves	Appr Time:	10 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Understand the types of oscillations and their implications.	CO1	L2
2	Illustrate production of shock waves by using waves in Reddy Shock tube	CO2	L3
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Definition of SHM, Characteristics, Examples and Derivation of differential equation of motion for SHM.	CO1	L2,
2	Mechanical simple harmonic oscillator. (Mass suspended to spring oscillator) – Description.	CO1	L2
3	Complex notation of simple harmonic motion (Aei(ωt + ε)), Phasor representation of simple harmonic motion. Equation of motion for free oscillations,	CO1	L3
4	Natural frequency of oscillations. Theory of damped oscillations (over damping critical and under damping) forced oscillations	CO1	L2
5	Resonance, sharpness of resonance. Example for mechanical resonance,	CO1	L3
6	Mach number, Properties of Shock waves, control volume.	CO1	L2
7	Laws of conservation of mass, energy and momentum.	CO1	L3
8	Construction and working of Reddy shock tube	CO1	L4
9	Applications of shock waves.	CO1	L4
10	Numerical	CO1	L4
c	**Application Areas**	**CO**	**Level**
1	Understand the car shock absorbers and musical instruments.	CO1	L2
2	Analyze the concrete structures.	CO2	L4
d	**Review Questions**	-	-
1	Definition of SHM	CO1	L1
2	Derivation of equation for SHM	CO1	L3
3	Define Mechanical Simple harmonic oscillators	CO1	L2
4	Explain complex notation and phasor representation of simple harmonic motion	CO1	L4
5	Derive Equation of motion for free oscillations, Natural frequency of	CO1	L2

	oscillations		
6	Define over damping, critical & under damping, quality factor	CO1	L2
7	Explain Theory of forced oscillations and resonance, Sharpness of resonance.	CO2	L2
8	Explain One example for mechanical resonance	CO2	L3
9	Define Mach number and Mach Regimes	CO2	L4
10	Ex[plain Properties of Shock waves	CO2	L1
11	Ex[plain Properties of control volume	CO2	L4
12	Explain Laws of conservation of mass, energy and momentum	CO2	L4
13	Explain Construction and working of Reddy shock tube	CO2	L4
14	Explain applications of shock waves.	CO2	L2
e	**Experiences**	-	-
1			
2			

Module – 2

Title:	Elastic Properties of Materials	Appr Time:	10 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Analyze the elastic properties of materials for engineering field using Hook's Law and Poisson's ratio.	CO3	L4
2	Calculate the couple per unit twist of a solid cylinder and period of oscillations for Torsional pendulum.	CO4	L3
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
11	Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress.	CO3	L3
12	Compressive stress, strain hardening and strain softening, failure (fracture/fatigue).	CO3	L3
13	Hooke's law, different elastic moduli: Poisson's ratio.	CO3	L3
14	Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of ✔ and β.	Co4	L3
15	Relation between Y, n and K, Limits of Poisson's ratio.	Co4	L3
16	Neutral surface and neutral plane, Derivation of expression for bending moment.	Co4	L3
17	Bending moment of a beam with circular and rectangular cross section. Single cantilever, derivation of expression for young's' modulus	Co4	L3
18	Torsion of cylinder: Expression for couple per unit twist of a solid cylinder (Derivation),	Co4	L4
19	Torsional pendulum-Expression for period of oscillation.	Co4	L4
20	Numerical problems	Co4	L4
c	**Application Areas**	**CO**	**Level**
1	Analyze the materials in mechanical engineering.	CO3	L3
2	Analyze the civil engineering structural elements.	CO4	L4
d	**Review Questions**	-	-
12	Define Elasticity.	CO3	L1
13	Define plasticity	CO3	L1

14	Define stress	CO3	L1
15	Define strain	CO3	L1
16	Define tensile stress	CO3	L1
17	Define shear stress	CO3	L1
18	Define compressive stres	CO3	L1
19	Define strain hardening	CO3	L1
20	Define strain softening	CO3	L1
21	Define fracture in Materials.	CO3	L1
22	Define Hooke's law.	CO3	L2
23	Explain Poisson's ratio.	CO3	L2
24	Derive Expression for Young's modulus (Y) in terms of ✔ and β.	CO3	L4
25	Derive Bulk modulus (K) in terms of ✔ and β.	CO3	L4
26	Derive Rigidity modulus (n) in terms of ✔ and β.	CO3	L4
27	Derive Relation between Y, n and K.	CO3	L4
28	Explain Neutral surface and neutral plane.	CO3	L3
29	Derive expression for bending moment.	CO4	L3
30	Explain Bending moment of a beam with circular cross section.	CO4	L2
31	Explain Bending moment of a beam with rectangular cross section.	CO4	L2
32	Define Single cantilever.	CO4	L1
33	Derive expression for young's' modulus	CO4	L4
34	Derive Expression for couple per unit twist of a solid cylinder	CO4	L4
35	Explain Torsional pendulum.	CO4	L2
36	Derive an Expression for period of oscillation.	CO4	L4
e	**Experiences**	-	-
1			
2			
3			
4			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:		18PHY12	Sem:	I	Marks:	50	Time:	90 minutes		
Course:		Engineering Physics								
-	-	Note: Answer any 3 questions, each carry equal marks.						Marks	CO	Level
1	a	What are Damped vibrations? Deduce the theory of damped oscillations..						8	co1	L3
	b	Define SHM and Derive the equation of motion for SHM and mention its solution.						7	co1	L2
	c	What is a Mach number? Distinguish between acoustic, ultrasonic, subsonic and supersonic waves based on Mach number						6	co2	L3
	d	For a particle Executing SHM, it's acceleration is found to be 15cm/s^2 when it is at 3cm from it's mean position. Calculate time period.						4	co1	L4
		or								
2	a	Describe the construction and working of Reddy tube with the help of a diagram.						8	co2	L3
	b	Derive the Expression for equivalent force constant for 2 springs in series and parallel combination.						7	co1	L3
	c	Define resonance, Explain the sharpness of resonance.						6	co1	L2
	d	In a Reddy Tube experiment it was found that, the time taken to travel between the two sensors is 195 μs. If the distance between the two sensors is 1oo mm. Find the Mach Number. (given-speed of sound in air=333 m/s)						4	co2	L4
3	a	Derive the Relation between Y, η & σ.						8	co3	L3

	b	S T for an elastic body shear Strain = Longitudinal strain + Compression strain.	7	co3	L3
	c	Explain The Nature of Elasticity with the help of stress – strain diagram	6	co3	L2
	d	Calculate the force required to produce an extension of 1mm in steel wire of length 2 m and diameter 1mm.(Young's modulus of the material of the beam is 2 x 10^{11} $N/m^{2.}$)	4	co3	L4
		or			
4	a	Derive the expression for couple per unit twist of solid Cylinder.	8	co4	L3
	b	Explain the different types of modulus of elasticity	7	co3	L3
	c	Mention the various types of beams with diagram and their Engineering Applications.	6	co3	L2
	d	A rectangular bar 2 cm ion breadth and 1 cm in thickness and 1 m in length is supported at its one ends and a load of 2 kg is applied at its middle. Calculate the dipression if the Young's modulus of the material of the beam is 2 x 10^{11} $N/m^{2.}$	4	co3	L4

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18PHY12	Sem:	I	Marks:	10	Time:	30 minutes
Course:	Engineering Physics						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Define SHM. Derivation of equation for SHM.	5	CO1	L3
2		Explain Mechanical simple harmonic oscillator.	5	CO1	L3
3		Explain complex notation and phasor representation of simple harmonic motion.		CO1	L4
4		Derive Equation of motion for free oscillations,	5	CO1	L3
5		Explain Natural frequency of oscillations.	5	CO1	L2
6		Define over damping, critical & under damping, quality factor	5	CO1	L1
7		Explain theory of forced oscillations and resonance, Sharpness of resonance.		CO1	L2
8		Explain one example for mechanical resonance	5	CO1	L2
9		Define Mach number and Mach Regimes	5	CO1	L1
10		Ex[plain Properties of Shock waves	5	CO1	L2
11		Ex[plain Properties of control volume		CO1	L2
12		Explain Laws of conservation of mass, energy and momentum	5	CO1	L3
13		Explain Construction and working of Reddy shock tube	5	CO1	L3
14		Explain applications of shock waves.	5	CO1	L3
15		Explain Elasticity and plasticity		CO1	L2
16		Define stress and strain	5	CO2	L1
17		Define tensile stress and shear stress	5	CO2	L1
18		Define compressive stress	5	CO2	L1
19		Define strain hardening and strain softening		CO2	L1
20		Define fracture in Materials.	5	CO2	L1
21		Define Hooke’s law.	5	CO2	L1
22		Explain Poisson’s ratio.	5	CO2	L2
23		Derive Expression for Young’s modulus (Y) in terms of ✔ and β.		CO2	L3
24		Derive Bulk modulus (K) in terms of ✔ and β.	5	CO2	L3
25		Derive Rigidity modulus (n) in terms of ✔ and β.	5	CO2	L3
26		Derive Relation between Y, n and K.	5	CO2	L3
27		Explain Neutral surface and neutral plane.		CO2	L3

28		Derive expression for bending moment.	5	CO2	L3
29		Explain Bending moment of a beam with circular cross section.	5	CO2	L2
30		Explain Bending moment of a beam with rectangular cross section.	5	CO2	L2
31		Define Single cantilever.		CO2	L1
32		Derive expression for Young's modulus	5	CO2	L3
33		Derive Expression for couple per unit twist of a solid cylinder	5	CO2	L3
34		Explain Torsional pendulum.	5	CO2	L3
35		Derive an Expression for period of oscillation.		CO2	L3
36					

D2. TEACHING PLAN - 2

Module – 3

Title:	Maxwell's Equation, EM waves and Optical fibers	Appr Time:	10 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Analyze the Maxwell's equation by using EM waves.	CO5	L2
2	Illustrate the point to point communication using optical fibers.	CO6	L3
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
21	Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static)	CO5	L3,L4,
22	Gauss' divergence theorem and Stokes' theorem.	CO5	L3
23	Description of laws of electrostatics, magnetism and Faraday's laws of EMI.	CO5	L4
24	Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum	CO5	L3
25	The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations),	CO5	L4
26	Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves(Qualitative)	CO5	L3
27	Propagation mechanism, angle of acceptance. Numerical aperture. Modes of propagation.	CO5	L3
28	Types of optical fibers. Attenuation: Causes of attenuation and Mention expression for attenuation coefficient.	CO5	L3
29	Discussion of block diagram of point to point communication. Merits and demerits	CO5	L3
30	Numerical problems	CO5	L4
c	**Application Areas**	**CO**	**Level**
1	Analyze the EM communication and wireless communication.	CO5	L4
2	Optical fibers are used in the medical field, communication system.	CO6	L4
d	**Review Questions**	-	-
1	Define Fundamentals of vector calculus.	CO5	L1
2	Define Divergence	CO5	L3
3	Define curl of electric field	CO5	L2
4	Define magnetic field (static)	CO5	L4
5	Derive Gauss' divergence theorem.	CO5	L2
6	Derive Stokes' theorem.	CO5	L5
7	Describe laws of electrostatics	CO5	L2

8	Describe laws of magnetism	CO5	L3
9	Describe laws of Faraday's laws of EMI.	CO5	L4
10	Define Current density.	CO5	L1
11	Explain equation of Continuity.	CO5	L4
12	Derive displacement current Maxwell's equations in vacuum	CO5	L3
13	Derive wave equation in differential form in free space using Maxwell's equations.	CO5	L3
14	Explain Plane electromagnetic waves in vacuum.	CO5	L2
15	Define transverse nature.	CO5	L1
16	Define polarization of EM waves.	CO5	L1
17	Explain Propagation mechanism in an optical fiber.	CO6	L2
18	Define angle of acceptance.	CO6	L1
19	Define Numerical aperture.	CO6	L1
20	Based on Modes of propagation Explain Types of optical fibers	CO6	L2
21	Mention the Causes of attenuation in an optical fiber.	CO6	L2
22	Mention the expression for attenuation coefficient.	CO6	L1
23	Discuss point to point communication system of an optican fiber.	CO6	L3
24	Explain Merits and demerits of an Optical Fibers.	CO6	L3
e	**Experiences**	-	-
1			
2			

Module – 4

Title:	Quantum Mechanics and Lasers	Appr Time:	10 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Compute the Eigen values and eigen function by using the time independent 1D Schrodinger wave equation	CO7	L3,L4
2	Analyze the production and applications of laser.	CO8	L4
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Introduction to Quantum mechanics, Wave nature of particles.	CO7	L2
2	Heisenberg's uncertainty principle and applications (non confinement of electron in the nucleus).	CO7	L3
3	Schrodinger time independent wave equation.	CO7	L4
4	Significance of Wave function,Normalization.	CO7	L4
5	Particle in a box, Energy eigen values of a particle in a box and probability densities	CO7	L4
6	Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for laser action.	CO8	L2
7	Principle, Construction and working of CO2.	CO8	L3
8	Principle, Construction and working of semiconductor Lasers.	CO8	L3
9	Application of Lasers in Defense (Laser range finder) and Engineering (Data storage)	CO8	L4
10	Numerical problems	CO7,CO8	L4
c	**Application Areas**	**CO**	**Level**

1	Used in materials engineering, photonics, MRI.	CO8	L3
2	Used in medical field, communication, Industry applications.	CO7	L4
d	**Review Questions**	-	-
1	Define Quantum mechanics	CO7	L1
2	Explain Wave nature of particles	CO7	L3
3	State Heisenberg's uncertainty principle.	CO7	L2
4	Show that non confinement of electron in the atomic nucleus.	CO7	L4
5	Derive Schrodinger time independent wave equation.	CO7	L2
6	Define Significance of Wave function.	CO7	L5
7	Define Significance of Normalization.	CO7	L2
8	Define Particle in a box.	CO7	L3
9	Derive Energy eigen values of a particle in a box.	CO7	L4
10	Explain probability densities.	CO7	L1
11	Define spontaneous Emission processes.	CO8	L4
12	Define stimulated Emission processes.	CO8	L1
13	Derive expression for energy density of radiation interms of Einstein's coefficients.	CO8	L3
14	Explain Requisites of a Laser system.	CO8	L2
15	Define Conditions for laser action	CO8	L1
16	Explain Principle, Construction and working of CO2 Lasers.	CO8	L3
17	Explain Principle, Construction and working of semiconductor Lasers.	CO8	L3
18	Explain Laser range finder.	CO8	L3
19	Explain Data storage.	CO8	L4
e	**Experiences**	-	-
1			
2			

E3. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	18PHY12	Sem:	I	Marks:	30	Time:	75 minutes
Course:	Engineering Physics						

-	-	**Note: Answer any 2 questions, each carry equal marks.**	**Marks**	**CO**	**Level**
1	a	With neat diagram, derive an expression for numerical aperture and Acceptance angle.	8	9	L3
	b	With neat diagram explain the different types of optical fiber	8	9	L3
	c	Explain point to point communication system using optical fibers. & write any four advantages of optical communication system.	5	9	L4
	d	An optical fiber has a core material with refractive index 1.50 and its cladding material has a refractive index of 1.45. The light is launched into it in air. Calculate its numerical aperture and the fractional index change.	4	9	L4
		Or			
2	a	Describe the concept of divergence. Derive Gauss divergence theorem.	8	9	L3
	b	Mention Maxwell's equations for electromagnetic field. Starting from Maxwell's equation deduce the wave equation for a plane wave in free space.	8	9	L3

	c	What is displacement current? Obtain the expression for displacement current.	5	9	L4
	d	Calculate the curl of $\vec{A}$, given $\vec{A} = (1+yz^2)\hat{a}+xy^2\hat{a}+x^2y\hat{a}$	4	9	L4
3	a	Derive expression for energy density of radiation in terms of Einstein's coefficients.	8	10	L4
	b	Explain Construction and working of Semiconductor Diode Laser With Diagram.	8	10	L4
	c	Explain Range Finder and Compact Disc.	5	10	L4
	d	The average output power of laser source emitting a laser beam of wavelength 6328 A^0 is 5mW. Find the number of emitted photons emitted per second by the laser source.	4	10	L4
		Or			
4	a	Obtain the solution of Schroedinger's time independent wave equation, When applied to a potential well of infinite height.	8	10	L4
	b	Derive Time independent Schrödinger wave equation.	8	10	L3
	c	Explain Heisenberg's uncertainty principle and give its physical significance.	5	10	L4
	d	An electron is bound in a one dimensional potential well of width 0.18nm. Find its energy value in eV in the second excited state. (Given h= 6.63 X 10^{-34}JS, m = 9.11 X 10^{-31}Kg)	4		L4

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18PHY12	Sem:	I	Marks:	10	Time:	30 minutes
Course:	Engineering Physics						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Define Fundamentals of vector calculus.	5	CO5	L1
2		Define Divergence and curl of electric field.	5	CO5	L1
3		Define magnetic field (static) and Derive Gauss' divergence theorem.	5	CO5	L1
4		Derive Stokes' theorem.	5	CO5	L3
5		Describe laws of electrostatics and laws of magnetism.	5	CO5	L2
6		Describe laws of Faraday's laws of EMI and Current density.	5	CO5	L2
7		Explain equation of Continuity.	5	CO5	L3
8		Derive displacement current Maxwell's equations in vacuum	5	CO5	L3
9		Derive displacement current Maxwell's equations in vacuum	5	CO5	L3
10		Derive wave equation in differential form in free space using Maxwell's equations.	5	CO5	L3
11		Explain Plane electromagnetic waves in vacuum.	5	CO5	L2
12		Define transverse nature and polarization of EM waves.	5	CO5	L1
13		Explain Propagation mechanism in an optical fiber.	5	CO6	L2
14		Define angle of acceptance and Numerical aperture.	5	CO6	L1
15		Based on Modes of propagation Explain Types of optical fibers	5	CO6	L3
16		Explain the Causes of attenuation in an optical fiber and Mention the expression for attenuation coefficient.	5	CO6	L3

17		Discuss point to point communication system of an optical fiber.	5	CO6	L4
18		Explain Merits and demerits of an Optical Fibers.	5	CO6	L2
19		Explain the necessity of Quantum mechanics and Wave nature of particles	5	CO7	L2
20		State and Explain Heisenberg's uncertainty principle.	5	CO7	L2
21		Show that non confinement of electron in the atomic nucleus.	5	CO7	L3
22		Derive the Schrodinger time independent wave equation.	5	CO7	L4
23		Define Significance of Wave function and Normalization.	5	CO7	L1
24		Define Particle in a box and Derive Energy eigen values of a particle in a box and Probability density.	5	CO7	L1
25		Define spontaneous Emission processes and stimulated Emission processes.	5	CO8	L1
26		Derive expression for energy density of radiation in terms of Einstein's coefficients.	5	CO8	L3
27		Explain the Requisites and Conditions for laser action.	5	CO8	L2
28		Explain Principle, Construction and working of CO2 Lasers.	5	CO8	L2
29		Explain Principle, Construction and working of semiconductor Lasers.	5	CO8	L4
30		Explain Laser range finder and Data storage.	5	CO8	L4
31		Explain Laser Cutting, laser welding and Laser Drilling.	5	CO8	L3
32					

D3. TEACHING PLAN - 3

Module – 5

Title:	Material Science	ppr Time:	10 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Analyze the electrical and thermal properties of conductor using Quantum theory.	CO9	L4
2	Analyze the electrical conductivity of semiconductors using band theory of solids.	CO10	L4
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
41	Quantum Free electron theory of metals: Review of classical free electron theory, mention of failures.	CO9	L3
42	Assumptions of Quantum Free electron theory, Mention of expression for density of states.	CO9	L3
43	Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level,	CO9	L4
44	Derivation of the expression for Fermi energy, Success of QFET.	CO9	L4
45	Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression),	CO9	L4
46	Conductivity of semiconductors(derivation),	CO9	L3
47	Hall effect, Expression for Hall coefficient(derivation)	CO9	L3
48	Polar and non-polar dielectrics, Internal fields in a solid, Clausius-Mossotti equation(Derivation),	CO9	L3
49	Mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers.	CO9	L3
50	Numerical problems	CO9	L4

c	**Application Areas**	**CO**	**Level**
1	Used in electrical and electronics engineering.	CO10	L4
2	Design of active electronic components.	CO9	L4
d	**Review Questions**	-	-
1	Define classical free electron theory.	CO9	L1
2	Define Failures of classical free electron theory.	CO9	L3
3	Explain Assumptions of Quantum Free electron theory.	CO9	L2
4	Mention of expression for density of states.	CO9	L4
5	Mention of expression for Fermi-Dirac statistics	CO9	L2
6	Mention of expression for Fermi factor	CO9	L2
7	Mention of expression for Fermi level	CO9	L2
8	Derive the expression for Fermi energy, Success of QFET	CO9	L3
9	Explain Fermi levels in intrinsic semiconductors.	CO10	L4
10	Expression for concentration of electrons in conduction band.	CO10	L1
11	Mention the expression for Hole concentration in valance band.	CO10	L4
12	Derive the expression for Conductivity of semiconductors.	CO10	L3
13	Explain Hall effect.	CO10	L2
14	Derive the expression for Hall coefficient.	CO10	L3
15	Explain polar dielectrics.	CO10	L3
16	Explain non-polar dielectrics.	CO10	L2
17	Explain internal fields in a solid.	CO10	L2
18	Derive the Expression for Clausius-Mossotti equation.	CO10	L3
19	Mention Solid dielectrics with one example.	CO10	L2
20	Mention liquid dielectrics with one example.	CO10	L2
22	Mention gaseous dielectrics with one example.	CO10	L2
23	Explain Application of dielectrics in transformers.	CO10	L3
e	**Experiences**	-	-
1			
2			

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18PHY12	Sem:	I	Marks:	10	Time:	30 minutes
Course:	Engineering Physics						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Define classical free electron theory.	5		L2
2		Define Failures of classical free electron theory.	5		L3
3		Explain Assumptions of Quantum Free electron theory.			L4
4		Mention of expression for density of states and Fermi-Dirac statistics.	5		L3
5		Mention of expression for Fermi factor and Fermi level.	5		L2
6		Derive the expression for Fermi energy, Success of QFET	5		L3
7		Explain Fermi levels in intrinsic semiconductors.	5		L3
8		Mention the expression for concentration of electrons in conduction band and Hole concentration in valance band.	5		L3
9		Derive the expression for Conductivity of semiconductors.	5		L4
10		Exlain Hall effect. And Derive the expression for Hall coefficient.	5		L4

11		Explain polar dielectrics and non-polar dielectrics.	5		L3
12		Explain internal fields in a solid.	5		L2
13		Derive the Expression for Clausius-Mossotti equation.	5		L2
14		Mention Solid, liquid and gaseous dielectrics with one example.	5		L3
15		Explain Application of dielectrics in transformers.	5		L4

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	18PHY12	Sem:	I	Marks:	30	Time:	75 minutes
Course:	Engineering Physics						

-	-	**Note: Answer any 2 questions, each carry equal marks.Derive the wave equation in differential form in free space using maxwell's equation.**	**Marks**	**CO**	**Level**
1	a	Discuss the failures of classical free electron theory.	6	9	L3
	b	Give the assumptions of QFET.	5	9	L3
	c	Calculate the probabilities of an electron occupying an energy level 0.02 eV above the fermi level and that in an energy level 0.02 eV below the Fermi level at 200K.	4	9	L4
		Or			
2	a	What is Hall effect? Obtain the expression for Hall voltage in terms of Hall Coefficient.	6	9	L3
	b	Define the Fermi factor. Explain the variation of fermi factor with example.	5	9	L3
	c	The Hall coefficient is 3.68 x 10^{-6} m^{-3}/C. What is the type of charge carriers? Also calculate the carrier concentration.	4	9	L4
3	a	Obtain the relation between fermi energy and energy gap for an Intrinsic semiconductor.	6	10	L4
	b	Discuss the various types of polarization.	5	10	L4
	c	The following data given for intrinsic germanium at 300 K, ni = 2.4 X 10 19/m3, µo = 0.39 m2v-1s-1, µh=0.19 m2v-1s-1. Calculate the resistivity of sample.	4	10	L4
		Or			
	a	Derive the Expression for Clausius-Mossotti equation.	6	10	L4
	b	Explain Application of dielectrics in transformers.	4	10	L3
	c	If a NaCl crystal is subjected to an electric field of 1000 V/m and the resulting polarization is 4.3 X 10-8 C/m2, Calculate the dielectric constant of NaCl.	5	10	L4

F. EXAM PREPARATION

1. University Model Question Paper

Course:	Engineering Physics					Month / Year	Jan /2019
Crs Code:	18PHY12	Sem:	I	Marks:	100	Time:	180 minutes

-	**Note**	Answer all FIVE full questions. All questions carry equal marks.	**Marks**	**CO**	**Level**
1	a	Define SHM. Derivation of equation for SHM.	5	CO1	L3
	b	Explain complex notation and phasor representation of simple harmonic motion.	6	CO1	L3
	c	Derive Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of ✔ alpha and Beta.	5	CO2	L3
	d	Calculate the period of oscillation of a mass 40kg on a spring with constant k=10 N/m.	4	CO2	L4

		OR			
2	a	Explain Construction and working of Reddy shock tube and Applications of Shock Waves.	5	CO2	L3
	b	Define Resonance. Explain Sharpness of Resonance and give an example for Mechanical Resonance.	6	CO1	L3
	c	Define Elasticity, plasticity, stress, strain, tensile stress and shear stress.	5	CO2	L2
	d	In a Reddy Tube experiment, it was found that, the time taken to travel between the two sensors is 195μs. If the distance between the two sensors is 100nm, find the Mach number.	4	CO1	L4
3	a	Explain strain hardening and strain softening.	5	C03	L3
	b	Derive Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of ✔ and β.	6	C03	L3
	c	Explain Bending moment of a beam with circular cross section.	5	C04	L3
	d	A particle executes a SHM of period of 10s and amplitude of 1.5m. Calculate its maximum acceleration and velocity.	4	C04	L4
		OR			
4	a	Derive the expression for bending moment.	5	CO4	L3
	b	Derive the Expression for couple per unit twist of a solid cylinder.	6	CO4	L3
	c	Explain Neutral surface and neutral plane.	5	CO3	L3
	d	Calculate the percentage change in the frequency of oscillations of a spring if the mass attached to the spring is increased by 50%.	4	CO3	L4
5	a	Explain Attenuation mechanism and mention the equation of attenuation coefficient.	5	CO7	L3
	b	Derive the wave equation in differential form in free space using maxwell's equation	6	CO6	L3
	c	Define Divergence and curl of electric and magnetic field.	5	CO6	L2
	d	Find the ratio of population of two energy levels in a medium at thermal equilibrium, if the wavelength of light emitted at 291K is 6928A°.	4	CO7	L4
		OR			
6	a	Discuss point to point communication system with Block Diagram.	5	CO6	L3
	b	Derive angle of acceptance and Numerical aperture in an optical fiber.	6	CO7	L3
	c	Explain Applications of dielectrics in transformers.	5	CO6	L2
	d	Find the ratio of population of two energy levels in a medium at thermal equilibrium, if the wavelength of light emitted at 291K is 6928A°.	4	CO7	L4
7	a	Explain Heisenberg uncertainty principle with an example.	5	CO9	L3
	b	Explain Principle, Construction and working of CO2 Lasers.	6	CO8	L3
	c	Find Energy eigen values of a particle in a box.	5	C09	L4
	d	An electron is bound in a one dimensional potential well of width 0.18nm. Find its energy value in eV in the second excited state.	4	CO9	L4
		OR			
8	a	Derive time independent Schrodinger wave equation.	5	CO9	L3
	b	Explain Principle, Construction and working of semiconductor Lasers.	6	CO8	L3
	c	Explain the Requisites and Conditions for laser action.	5	CO8	L2
	d	A He-Ne laser is emitting a laser beam with an average power of 4.5mW. Find the number of photons emitted per second by t6he laser. The wavelength of emitted radiation is 632.8A°	4		
9	a	Explain the failures of classical free electron theory.	5	CO9	L2
	b	Derive the conductivity of semiconductor.	6	CO10	L3
	c	Explain the success of free electron theory.	5	CO9	L2

	d	A 5.00 μF parallel plate capacitor has air between the plates. When an insulating material is placed between the plates, the capacitances increases to 13.5 μF. Find the dielectric constant of the insulator.	4	CO10	L4
		OR			
10	a	Define Hall effect and Derive the Expression for Hall coefficient.	5	CO10	L3
	b	What are Dielectrics. Derive Clausius-Mossotti equation.	6	CO10	L3
	c	Explain Application of dielectrics in transformers.	5	C010	L3
	d	The Hall coefficient is 3.68 x 10^{-6} m^{-3}/C. What is the type of charge carriers ? Also calculate the carrier concentration.	4	CO10	L4

2. SEE Important Questions

Course:	Engineering Physics					Month / Year	Jan /2019	
Crs Code:	18PHY12	Sem:	3	Marks:	100	Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.				-	-	
Module	Qno.	Important Questions				**Marks**	**CO**	**Year**
1	1	Define SHM. Derivation of equation for SHM.				5	CO1	
	2	Explain complex notation and phasor representation of simple harmonic motion.				5	CO1	
	3	Define over damping, critical & under damping, quality factor				4	CO1	
	4	Define Resonance. Explain Sharpness of Resonance and give an example for Mechanical Resonance.				5	CO2	
	5	Explain Construction and working of Reddy shock tube and Applications of Shock Waves.				6	CO2	
2	1	Define Elasticity, plasticity, stress, strain, tensile stress and shear stress.				6	CO3	
	2	Derive Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of ✔ and β.				6	CO3	
	3	Derive the expression for bending moment.				5	CO3	
	4	d				5	CO4	
	5	Explain Bending moment of a beam with circular and rectangular cross section.				6	CO4	
							CO5	
3	1	Define Divergence and curl of electric and magnetic field.				6	CO5	
	2	Derive angle of acceptance and Numerical aperture in an optical fiber.				6	CO5	
	3	Derive the wave equation in differential form in free space using maxwell's equation.				5	CO6	
	4	Explain Attenuation mechanism and mention the equation of attenuation coefficient.				6	CO6	
	5	Discuss point to point communication system with Block Diagram.				5	CO6	
4	1	Explain Heisenberg uncertainty principle with an example.				5	CO7	
	2	Derive time independent schrodinger wave equation.				6	CO7	
	3	Find Energy eigen values of a particle in a box.				6	CO7	
	4	Explain Principle, Construction and working of CO2 Lasers.				6	CO8	
	5	Explain Principle, Construction and working of semiconductor Lasers.				6	CO8	
5	1	Explain the failures of classical free electron theory				5	CO9	
	2	Explain the success of free electron theory				5	CO9	
	3	Derive the conductivity of semiconductor.				5	CO10	
	4	Define Hall effect and Derive the Expression for Hall coefficient.				6	CO10	
	5	What are Dielectrics. Derive Clausius-Mossotti equation.				6	CO10	

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA

Module-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Definition of SHM, Characteristics, Examples and Derivation of differential equation of motion for SHM starting from Hookes' law and mention its solution. Mechanical simple harmonic oscillator: Mass suspended to spring (vertical vibrations) - Description, Mention of Expression for time period/frequency, Definition of force constant and its significance, Derivation of expressions for force constants for series and parallel combination of springs. Complex notation of simple harmonic motion (Aei(ωt + ε)), Phasor representation of simple harmonic motion. Theory of damped oscillations (over damping critical and under damping) forced oscillations and resonance, sharpness of resonance. Example for mechanical resonance.	06	L2 Understand	L2	Understand -	Lecture, PPT, Classroom Expt.	Slip Test
1	Mach number, properties of shock waves, control volume. Laws of conservation of mass, energy and momentum. Construction and working of Reddy shock tube. Applications. Numerical Problems	04	L4 Illustrate	L4	- Understand, Illustrate -	Lecture, PPT	Slip Test
2	Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress, compressive stress, strain hardening and strain softening, failure. Hookes law, Poison's ratio, Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n). Relation between Y, K & n. Limits of Poisson's ratio. Neutral surface and Neutral Plane, derivation of expression for bending moment. Bending momentum of a beam with circular and rectangular cross section.	07	L4 Analyze	L4	- Analyze -	Lecture, PPT, Classroom Expt.	Slip Test
2	Expression for couple per unit test of a solid cylinder (Derivation), Torsional Pendulum. Numerical problems.	03	L3 Analyze	L3	-Analyze -	Lecture, PPT, Classroom Expt.	Slip Test
3	Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics,	06	L4 Analyze	L4	- Understand -Analyze	Lecture, PPT, Classroom Expt.	Slip Test

	magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum. The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves (Qualitative).						
3	Propagation mechanism, angle of acceptance. Numerical aperture. Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and Mention of expression for attenuation coefficient. Discussion of block diagram of point to point communication. Merits and demerits Numerical problems	04	L4 Illustrate	L4	-Understand -Illustrate	Lecture, PPT, Classroom Expt.	Slip Test
4	Introduction to Quantum mechanics, Wave nature of particles, Heisenberg's uncertainty principle and applications (non confinement of electron in the nucleus), Schrodinger time independent wave equation, Significance of Wave function, Normalization, Particle in a box, Energy eigen values of a particle in a box and probability densities.	05	L4 Compute	L4	-Understand -Compute	Lecture, PPT	Slip Test
4	Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of CO2 and semiconductor Lasers. Application of Lasers in Defense (Laser range finder) and Engineering (Data storage). Numerical problems	05	L4 Analyze	L4	-Understand -Analyze	Lecture, PPT, Classroom Expt.	Slip Test
5	Review of classical free electron theory, mention of failures. Assumptions of Quantum Free electron theory, Mention of expression for density of states, Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level, Derivation of the expression for Fermi energy, Success of QFET.	04	L4 Analyze	L4 Analyze	-Analyze-	Lecture, PPT	Slip Test
5	Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression), Conductivity of semiconductors(derivation), Hall effect, Expression for Hall coefficient(derivation) polar and non-polar dielectrics, internal fields in a solid, Clausius - Mossotti equation (Derivation), mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers. Numerical problems	06	L4 Analyze	L4 Analyze	-Analyze-	Lecture, PPT,	Slip Test

2. Concepts and Outcomes:

Table 2: Concept to Outcome

Module-#	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome Student Should be able to ...
A	*I*	*J*	*K*	*L*	*M*	*N*
1	Motion	Vibrations	Oscillations	Understand the concept of SHM, Damped and free oscillation.	-Understand -Oscillations -lecture	Understand the types of oscillations and their implications.
1	Analysis and Application of shock waves	waves	Shock waves	Understand and Illustrate the shock waves	-Illustrate -Shock waves -lecture /PPT	Illustrate production of shock waves by using waves in Reddy Shock tube
2	- forces - Size, shapes of materials	Properties of materials	Elasticity	Analyze the elastic properties of materials	-Analyze -Elastic properties - lecture	Analyze the elastic properties of materials for engineering field using Hook's Law and Poisson's ratio.
2	- couple -forces	Application of forces	Torque	Understand the working of Torsional Pendulum	-Analyze -Torsional Pendulum -lecture	Calculate the couple per unit twist of a solid cylinder and period of oscillations for Torsional pendulum.
3	- Study of Vector, scalar - Electromagnetic waves	EM spectrum	Electric and Magnetic field	Understand and analyze the Maxwell's equations	-Analyze -Maxwell's equation -lecture	Analyze the Maxwell's equation by using EM waves.
3	- Transmission of light -	- Reflection - Refraction	Total internal reflection	Illustrate the point to point communication	-Illustrate -Optical fibers -lecture	Illustrate the point to point communication using optical fibers.
4	- Classical physics	Subatomic nature of particles	Heisenberg's Uncertainty Principle	Compute Eigen values	-Apply -Eigen values - lecture	Compute the Eigen values and eigen function by using the time independent 1D Schrodinger wave equation
4	-energy	Emission	Interaction	Understand and	-Analyze	Analyze the

	level transitions	and absorption processes	of radiation with matter	analyze the process of interaction of radiation with matter	-interaction of photons with matter -lecture	production and applications of laser.
5	- classificatio n of solids -	- band theory of solids -	Free electron theory	Analyze the electrical and thermal properties	-Analyze -Electrical and Thermal properties -lecture	Analyze the electrical and thermal properties of conductor using Quantum theory.
5	- classificatio n of solids -	- band theory of solids -	Material Physics	Analyze conductivity of semiconductors.	- Analyze - Semiconductors and Dielectrics -lecture	Analyze the electrical conductivity of semiconductors using band theory of solids.