Department : Physics
Class : I B.Sc. Physics

Title of the Course : Core Course –I: PROPERTIES OF MATTER AND ACOUSTICS
Semester : I
Course Code : PU231CC1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PP2035	6	-	-	6	6	90	25	75	100

Learning Objectives

1. To Study of the properties of matter leads to information which is of practical value to the physicists.
2. To provide an information about the internal forces which act between the constituent parts of the substance.

Course Outcomes

On the successful completion of the course, student will be able to**:**		**PSO addressed**	**Cognitive Level**
1.	Relate elastic behavior in terms of three modulii of elasticity and working of torsion pendulum.	**PSO 1**	**K1 (R) & K2 (U)**
2.	Appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.	**PSO 2**	**K2 (U) & K3 (Ap)**
3.	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.	**PSO 1**	**K2 (U) & K3 (Ap)**
4.	Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains	**PSO 3**	**K1 (R) & K3 (Ap)**
5.	Understand the concept of acoustics, importance of constructing buildings with good acoustics. Also to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves.	**PSO 4**	**K2 (U) & K3 (Ap)**

Modules

Credits: 6 **Total contact hours: 90 (Including assignments and tests)**

Unit	Section	Topics	Lecture hours	Cognitive Level	Pedagogy	Assessment/ Evaluation
I	**ELASTICITY**					
	1	Hooke's law – stress-strain diagram – elastic constants	5	K1 (R)	Lecture using chalk and talk, Discussion with Videos, mind mapping, Demonstration	Evaluation through: short test Class Test Multiple choice questions Quiz Formative assessment Short Summary or Overview
	2	Poisson's ratio – relation between elastic constants and Poisson's ratio	4	K3 (Ap)	Lecture using videos, Problem solving	
	3	work done in stretching and twisting a wire – twisting couple on a cylinder	5	K2 (U)	Demonstration, Peer tutoring, Problem solving, Review	
	4	rigidity modulus by static torsion– torsional pendulum (with and without masses)	4	K3 (Ap)	Demonstration, Peer tutoring, Problem solving, Review	
II	**BENDING OF BEAMS**					
	1	**C**antilever– expression for Bending moment – expression for depression at the loaded end of the	4	K2 (U)	Demonstration, Peer tutoring, Problem solving, Review	Evaluation through: Short test Quiz

		cantilever			Discussion with Video, mind mapping	Assignment Formative assessment Class test Practical.
	2	oscillations of a cantilever – expression for time period – experiment to find Young's modulus	4	K3 (Ap)	Demonstration, Peer tutoring, Problem solving, Review, Discussion with PPT, mind mapping	
	3	non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending	5	K3 (Ap)	Demonstration, Peer tutoring, Problem solving, Review, mind mapping	
	4	expression for elevation – experiment to determine Young's modulus using microscope	5	K3 (Ap)	Demonstration, Peer tutoring, Problem solving, Review	
III	**FLUID DYNAMICS**					
	1	Surface tension: definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles	5	K3 (Ap)	Lecture using chalk and talk, Discussion with video, mind mapping	Evaluation through: Class test Quiz
	2	determination of surface tension by Jaegar's method– variation of surface tension with temperature	4	K2 (U)	Lecture using videos, Problem solving	Multiple choice questions Formative assessment Practical

	3	Viscosity:definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube	4	K2 (U)	Lecture using videos, Demonstration, Peer tutoring, Problem solving, Review.	
	4	Poiseuille's formula –corrections – terminal velocity and Stoke's formula– variation of viscosity with temperature	5	K3 (Ap)	Demonstration, Peer tutoring, Problem solving, Review	
IV	**WAVES AND OSCILLATIONS**					
	1	Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM- composition of two SHM in a straight line and at right angles	6	K2 (U)	Lecture using chalk and talk, Discussion with PPT, mind mapping	Evaluation through: Class test Quiz Short test Formative assessment II Practical
	2	Lissajous's figures- free, damped, forced vibrations – resonance and Sharpness of resonance.	4	K1 (R)	Lecture using videos, Problem solving	
	3	Laws of transverse vibration in strings – sonometer – determination of AC frequency using sonometer	4	K2 (U)	Demonstration, Peer tutoring, Problem solving, Review	

	4	determination of frequency using Melde's string apparatus	4	K3 (Ap)	Demonstration, Peer tutoring, Problem solving, Review	
V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:**					
	1	Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula	5	K1 (R)	Lecture using chalk and talk, Discussion with PPT, mind mapping	Evaluation through: Short test Class test Quiz Assignment Formative assessment II
	2	acoustic intensity – factors affecting the acoustics of buildings.	4	K3 (Ap)	Demonstration, Lecture using videos, Problem solving	
	3	Ultrasonic waves: production of ultrasonic waves – Piezoelectric crystal method	5	K2 (U)	Demonstration, Peer tutoring, Problem solving, Review, Lecture using videos.	
	4	magnetostriction effect –application of ultrasonic waves	4	K3 (Ap)	Demonstration, Peer tutoring, Problem solving, Review, Lecture using videos.	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Employability**
Activities (Em/ En/SD): **Model Making**
Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -
Activities related to Cross Cutting Issues :-
Assignment : (Mention Topic and Type): **Application of ultrasonics – LMS**

Sample questions

Part A (1 mark)

Answer all the questions

1. The ratio of volume stress to the volume strain is known as _____ **(K2-U, CO 1)**
   a) Volume stain b) Young's modulus c) Bulk modulus d) none of the above
2. The ratio of change in any dimension to its original value is called _____**(K1-R, CO 2)**
   a) stress b) stain c) poisson's ratio d) Rigidity modulus
3. The unit of co-efficient of viscosity is _____ (**K1-R, CO 3)**
   a) Nm b) N/sec c) Nm^2 d) Nsm^{-2}
4. The simple pendulum vibrates with a time period T given by _____ (**K3-Ap, CO 4)**
   a) $T = 2\pi \frac{l}{g}$ (b) $T = 2\pi \frac{k}{g}$ (c) $T = \pi \frac{l}{g}$ (d) $T = \pi \frac{l}{2g}$
5. The persistence of sound in an enclosure due to multiple reflections of sound at the walls after the source has ceased to emit sound is known as _____. (**K1-R, CO 5)**

Part B (4 marks)

1. Define beam. Derive the expression for bending moment. **(K2-U, CO 1)**
2. Derive an expression for time period of cantilever oscillations. **(K2- U, CO 2)**
3. Explain streamline flow and turbulent flow**.. (K1-R, CO 3)**
4. Obtain the differential equation of S.H.M. **(K2-U, CO 4)**
5. Explain the production of ultrasonic waves using piezoelectric crystal method.**(K2-U, CO 5)**

Part C (9 marks)

1. Explain in detail different moduli of elasticity and Possion's ratio. **(K2-U, CO1)**
2. Explain the experimental method to determine the Youngs modulus of the beam using non uniform set up. **(K2- U, CO 2)**
3. Describe Jaegar's method of determining surface tension of liquids. **(K2-U, CO 3)**
4. Explain the transverse and longitudinal mode of the Melde string and hence determine the frequency of the fork. **(K3- Ap, CO 4)**
5. Discuss the factors affecting the architectural acoustics and their remedies.**(K3-Ap, CO 5)**

Dr. S. Sonia & Dr. P.Aji Udhaya

Head of the Department **Course Instructor**

Teaching Plan

Department : Physics
Class : I B.Sc Mathematics
Title of the Course : Generic Elective : Allied Physics for Mathematics-I
Semester : I
Course Code : PU231GE1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PU231GE1	4	-	-	3	4	60	25	75	100

Objectives

- To impart basic principles of Physics
- To incorporate concepts of Physics in day to day life

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	Acquire knowledge on elementary ideas of waves, properties of matter, electricity and magnetism, electronics	PSO - 1	K1 & K2
CO - 2	Analyze the concepts of ultrasonics, surface tension and study their applications in the medical field.	PSO - 4	K3
CO - 3	Interpret the real-life solution using concepts of electricity, magnetism, and electronics in Digital India.	PSO - 3	K2
CO - 4	Apply their depth knowledge of Physics in day today life.	PSO - 3	K3
CO - 5	Develop their knowledge to carry out the practical by applying these concepts of Physics	PSO - 5	K3

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	1.	Simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses	3	K1(R)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	Evaluation through: short test Class Test Multiple choice questions Quiz Formative assessment Short Summary or Overview
	2.	laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires)	2	K1(R)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
	3.	ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography – ultrasonoimaging	4	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	
	4.	ultrasonics in dentistry – physiotheraphy, opthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.	3	K3(Ap)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
II	5.	Elasticity: elastic constants – bending of beam – theory of non-uniform bending – determination of Young's modulus by non- uniform bending	3	K1(R)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	Evaluation through: short test Class Test Multiple choice questions Quiz
	6.	energy stored in a	3	K2(U)	Peer tutoring,	

		stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum Viscosity: streamline and turbulent motion – critical velocity			Lecture using videos, Problem solving, Demonstration, PPT, Review	Formative assessment Short Summary or Overview
	7.	coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, Surface tension: definition	3	K3(Ap)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	
	8	molecular theory – droplets formation– shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.	3	K1(R)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
III	9	Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen	3	K1(R)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	Evaluation through: short test Class Test Multiple choice questions Quiz Formative assessment Short Summary or Overview
	10	Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system	3	K2(U)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
	11	thermodynamic equilibrium – laws	3	K3(Ap)	Lecture using Chalk and talk	

		of thermodynamics – heat engine – Carnot's cycle – efficiency			,Introductory session, Group Discussion, Mind mapping,	
	12	entropy – change of entropy in reversible and irreversible process.	3	K1(R)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
IV	13	Potentiometer – principle – measurement of thermo emf using potentiometer – magnetic field due to a current carrying conductor	3	K1(R)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	Evaluation through: short test Class Test Multiple choice questions Quiz Formative assessment Short Summary or Overview
	14	Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage	3	K1(R)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
	15	power factor and current values in an AC circuit – types of switches in household and factories	3	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	
	16	Smart wifi switches- fuses and circuit breakers in houses	3	K2(U)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
V	17	logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks	3	K1(R)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	Evaluation through: short test Class Test Multiple choice questions Quiz
	18	Boolean algebra – De Morgan's theorem – verification –	3	K3(Ap)	Peer tutoring, Lecture using videos, Problem solving,	

		overview of			Demonstration, PPT, Review	Formative assessment Short Summary or Overview
	19	Government initiatives:software technological parks under MeitY, NIELIT	3	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	
	20	Semiconductor laboratories under Dept. of Space – an introduction to Digital India	3	K2(U)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Skill Development**

Activities (Em/ En/SD): **Model making**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues : -

Assignment : Streamline and Turbulent motion -Demonstration

Seminar Topic: -

Sample questions (minimum one question from each unit)

Part A

1. The material used in magnetostriction method is _____.**(K1-R , CO-1)**
   a) Ferromagnetic b)dia magnetic c) paramagnetic d) None of the above
2. _____ is defined as the restoring force per unit area. **(K3-Ap , CO-2)**
3. A ---------- is a device for measuring potential differences. **(K2-U, CO-3)**
   a) Meter Bridge b) Potentiometer c) Carey Foster Bridge.
4. The maximum value of alternating current in any direction is called ---------- value of alternating current. **(K3-Ap, CO-4)**
   a) Peak b) Mean c) Maximum d) RMS
5. When NOT gate follows an AND gate, the combination is called as _____**(K3- Ap,CO-5)**
   a) NAND b) AND c) EX-OR d) NOR

Part B

1. Interpret the production of ultrasonic waves using piezoelectric crystal method. **(K2-U , CO-1)**
2. Derive the expression for the bending moment. **(K3-Ap , CO-2)**
3. Explain the change of entropy in reversible and irreversible process. **(K2-U, CO-3)**
4. How will you measure the thermo emf using potentiometer? Explain. **(K3-Ap, CO-4)**
5. Show that the NAND gate as universal building blocks. **(K3- Ap,CO-5)**

Part C

1. Describe the applications of ultrasonic waves. **(K2-U , CO-1)**
2. Determine the Rigidity modulus by Torsion pendulum by Dynamic torsion method. **(K3-Ap , CO-2)**
3. Obtain the efficiency of Carnot's cycle with suitable phase diagram. **(K2-U, CO-3)**
4. Define Biot-Savart's law and obtain an expression for field along the axis of the coil carrying current. **(K3-Ap, CO-4)**
5. Verify the De Morgan's theorem. **(K3- Ap,CO-5)**

Head of the Department Course Instructor

Teaching Plan

Department : Physics
Class : I B.Sc Physics
Title of the Course : Skill Enhancement Course- SEC I
Non Major Elective: Physics for Everyday Life
Semester : I
Course Code : PU231SE1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PU231SE1	2	-	-	2	2	30	25	75	100

Objectives

1. To introduce fundamental physics concepts and their applications in everyday life.
2. To comprehend where all physics principles have been applied in everyday life and to appreciate the concepts with a greater understanding, as well as to learn about Indian scientists who have made significant contributions to Physics.

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	Understand the knowledge of basic scientific principles and fundamental concepts in motion of bodies.	**PSO-1**	**K2**
CO - 2	Understand the basic laws of physics in domestic appliances	**PSO-1**	**K2**
CO - 3	Recall the physics notions applied in various optical instruments	**PSO-2**	**K2**
CO - 4	Comprehend the utilization of solar energy in everyday life activities	**PSO-3**	**K2**
CO - 5	Know about the various physicists contribution towards science and technology	**PSO-1**	**K1**

Teaching plan

Total Contact hours: 30 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/Evaluation
I	**MECHANICAL OBJECTS**					
	1	Spring scales, bouncing balls	**2**	K2(U)	Demonstration	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Formative assessment I
	2	Roller coasters, bicycles	**2**	K2(U)	PPT, illustration, group discussion	
	3	Rockets	**1**	K2(U)	PPT, Illustration	
	4	Space travel	**1**	K2(U)	PPT, Theoretical formulation	
II	**OPTICAL INSTRUMENTS AND LASER**					
	1	Vision corrective lenses, Polaroid glasses	**2**	K2(U)	PPT, Group discussion	Evaluation through: Online quiz, Short questions Descriptive answers Formative assessment I
	2	UV protective glass – Polaroid camera	**2**	K2(U)	PPT, Group discussion	
	3	Colour photography	**1**	K2(U)	Concept Explanation, Theoretical formulation	
	4	Holography and Laser	**1**	K2(U)	Demonstration, Group discussion	
III	**PHYSICS OF HOME APPLIANCES**					
	1	Bulb – fan – hair drier	**2**	K2(U)	Lecture method, Concept Explanation, Peer group learning, PPT	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept

	2	Television – air conditioners	**2**	K2(U)	Illustration, Theoretical formulation Group Discussion	explanations, Formative assessment I/II
	3	Microwave ovens – vacuum cleaners	**2**	K2(U)	Group discussion, PPT	
IV	**SOLAR ENERGY**					
	1	Solar constant – General applications of solar energy	**2**	K2(U)	Lecture method, Peer group learning, PPT	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept explanations, Short summary Formative assessment II
	2	Solar water heaters – Solar Photo – voltaic cells	**2**	K2(U)	Lecture method, group discussion, PPT	
	3	General applications of solar cells.	**2**	K2(U)	Group discussion, PPT	
V	**INDIAN PHYSICIST AND THEIR CONTRIBUTIONS**					
	1	C.V.Raman, HomiJehangirBhabha,	**2**	K1(R)	Lecture method, Peer group learning, PPT	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept explanations, Formative assessment II
	2	Vikram Sarabhai, Subrahmanyan Chandrasekhar,	**2**	K1(R)	Lecture method, Peer group learning, PPT	
	3	Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.	**2**	K1(R)	Lecture method, Peer group learning, PPT	

Course Focussing on Employability/ Entrepreneurship / Skill Development: **Skill Development**

Activities (Em/ En/SD): **Group Discussion**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment

Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment: (Mention Topic and Type): **General Applications of solar energy - descriptions through Google Classroom**

Seminar Topic: (if applicable): -

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. Spring balance works on the principle of _____
   a) Hooke's law b) Joule's law c) Hubble's law d) Newton's law
2. The abbreviation for LASER is _____
3. The hair dryer is also known as blow dryer. Say True / False.
4. Which one of the following material is used for collector tubes in solar water heater?
   a) Copper b) Iron c) Silver d) Aluminium
5. Who received the Nobel prize for physics for theoretical studies of the physical processes of importance to the structure and evolution of the stars?
   a) Vikram Sarabhai b) Subrahmanyan Chadrasekhar
   c) Sir C V Raman d) Homi Jehangir Bhabha

Part B (4 marks)

1. What is the physics principle behind the bouncing ball?
2. What are the characteristics of Laser light?
3. How the bulb glows light?
4. Explain the principle of solar cell.
5. How did Raman discovered the Raman effect?

Part C (8 marks)

1. Explain the working of Roller Coaster.
2. Discuss the various applications of Holography.
3. Discuss the working of a television.
4. Discuss the general applications of solar energy.
5. Discuss about Dr. A. P. J Abdul Kalam's contribution towards science and Technology.

Head of the Department **Course Instructor**

Dr. C. Nirmala Louis **Dr. R. Krishna Priya**

Teaching Plan

Department : Physics
Class : II B.Sc. Physics
Title of the Course : Core III: Heat and Thermodynamics
Semester : III
Course Code : PC2031

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PC2031	4	-	-	4	4	60	25	75	100

Objectives

- To understand the phenomena connected with various units of measurement of temperature, knowing the concept of specific heat capacities of matter and transmission of heat.
- To introduce the concept of lowering the temperature, liquefying gases and process of making heat to do mechanical work.

Course outcomes

CO	Upon completion of this course, students will be able to:	PSO addressed	Cognitive level
CO-1	understand experimental methods to determine the transmission of heat.	PSO - 4	K2(U)
CO-2	analyze the work and heat interactions associated with a prescribed process path and to perform a analysis of a flow system.	PSO - 1	K4(An)
CO-3	understand the basic concepts of thermodynamics like system, properties, equilibrium, pressure, specific volume, temperature and the laws of thermodynamics.	PSO - 4	K2(U)
CO-4	evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.	PSO - 3	K4(An)
CO-5	analyze Maxwell's thermo dynamical relations and their applications	PSO - 5	K5(E)

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	Thermometry and Calorimetry					
	1.	Platinum resistance thermometer - Calendar and Griffith's bridge	2	K2(U)	Introductory session, Lecture using Chalk and talk , PPT.	Evaluation through short test, MCQ, True/False, Short essays.
	2.	Thermoelectric effect – Seebeck effect.	2	K1(R)	Discussion, Mind mapping,	Concept definitions, MCQ.
	3.	Thermoelectric thermometers- International temperature scale – Thermistor	2	K3(Ap)	Lecture using Chalk and talk, PPT.	Evaluation through short test, MCQ, True/False, Explain Principle.
	4.	Specific heat capacity of Solids – Regnault's method of mixtures (solid) – specific heat capacity of liquids – Callendar and Barnes method.	3	K4(An)	Lecture using videos, Problem solving, Demonstration.	Evaluation through Definition, Derive specific heat for different matters.
	5.	Specific heat capacity of gases – Cp and Cv – Meyer's relation – Cv by Joly's differential steam calorimeter method – Cp by Regnault's method.	3	K5(E)	Lecture using Chalk and talk , Problem Solving, PPT.	Evaluation through Definition, Derive specific heat for different matters.
II	Low Temperature Physics					
	1.	Joule - Kelvin effect - Liquefaction of Air- Linde's Process.	2	K2(U)	Introductory session, Lecture using Chalk and talk , PPT.	Evaluation through short test, MCQ, True/False, Short essays.
	2.	Liquefaction of hydrogen - liquefaction of helium-Kammerling - Onne's method.	2	K4(An)	Lecture using videos, Problem solving, Demonstration.	Concept definitions, MCQ, Process explaination.
	3.	Helium I and II -	2	K2(U)	Discussion,	Evaluation

		Lambda point - production of low temperatures			Mind mapping,	through short test, MCQ, True/False, Differentiation between the types.
	4.	Adiabatic demagnetization – practical applications of low temperature - refrigerators and air-conditioning machines -	3	K3(Ap)	Lecture using Chalk and talk , Problem Solving, PPT.	Evaluation through short test, Long derivation.
	5.	Super fluidity - application of super fluidity.	3	K3(Ap)	Lecture using Chalk and talk , Problem Solving, PPT.	Evaluation through short test, Long essay.
III	Transmission of Heat					
	1.	Conduction – coefficient of thermal conductivity – Rectilinear flow of heat along a bar.	2	K5(E)	Lecture using Chalk and talk , discussion, Derivation.	Evaluation through short test, Long derivation.
	2.	convection – lapse rate – Stability of the atmosphere	2	K2(U)	Lecture , discussion , PPT	Concept definitions, MCQ.
	3.	Newton's law of cooling – determination of specific heat capacity of liquid	3	K4(An)	Lecture using Chalk and talk , Demonstration, discussion, Derivation.	Evaluation through short test, MCQ, True/False, Derive specific heat relation.
	4.	Radiation - black body – Kirchhoff's law – Stefan – Boltzmann law - energy distribution in black body spectrum	3	K4(An)	Lecture using videos, Problem solving,	Evaluation through Definition, Interpretation of a graph.
	5.	Wien's law – Rayleigh Jean's law– Planck's law - solar constant – water flow pyroheliometer.	2	K1(R)	Group Discussion, Lecture using videos,	Evaluation through Definition, Differentiate different laws.
IV	Kinetic Theory of Gases					

	1.	Kinetic Theory of gases- assumptions - Molecular collisions – mean free path – expression for mean free path	3	K1(R)	Lecture using Chalk and talk , discussion, Derivation.	Evaluation through short test, MCQ, True/False, Derive mean free path.
	2.	Transport Phenomenon – Brownian motion and its features - expression for viscosity.	3	K2(U)	Lecture , discussion , PPT	Evaluation through Different phenomena's, derive viscosity.
	3.	Diffusion and thermal conductivity of gas.	1	K3(Ap)	Lecture using Chalk and talk , discussion.	Evaluation through Definition,MCQ.
	4.	Experimental verification -Vander walls equation of state - Determination of Vander walls constant	2	K5(E)	Lecture using Chalk and talk , discussion, Derivation.	Long Derivations, MCQ, Relations
	5.	Relation between Vander Wall's constant and critical constants.	3	K5(E)	Lecture , discussion , PPT, Derivation.	Long Derivations, MCQ, Relations
V	Thermodynamics					
	1.	Zeroth and first law of thermodynamics – reversible and irreversible processes	2	K2(U)	Lecture discussion, PPT	Evaluation through Definition, MCQ, Differentiate the process.
	2.	isothermal process-adiabatic process-gas equation during adiabatic process - work done during adiabatic and isothermal process	2	K2(U)	Lecture using Chalk and talk , discussion, Derivation.	Evaluation through Definition, MCQ, Differentiate the process and calculate work done.
	3.	second law of thermodynamics – Carnot's engine – its efficiency.	2	K3(Ap)	Lecture discussion, PPT	Longer essay, MCQ.
	4.	Entropy – change of entropy in reversible	2	K3(Ap)	Lecture using Chalk and talk	Evaluation through

		and irreversible processes – temperature – entropy diagrams – physical significance of entropy - change of entropy when ice converted into steam			, discussion, Derivation.	Definition, MCQ, Derive entropy.
	5.	third law of thermodynamics – Extensive and Intensive thermodynamic variables – distinction between them	2	K4(An)	Group discussion, PPT	Check knowledge in different types of variables, Discussion,
	6.	Maxwell thermodynamical relations – derivation and application -	1	K5(E)	Lecture using Chalk and talk , discussion, Derivation.	Evaluation through derivation.
	7.	Clausius - Clapeyron equation and specific heat relation	1	K3(Ap)	Lecture using Chalk and talk , discussion, Derivation.	Evaluation through derivation.

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Skill Development

Activities (SD): Hands on training on refrigerators and air- conditioning machines.

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues :-

Assignment : Differentiate the types of thermoelectric effects.

Seminar Topic: -

Sample questions (minimum one question from each unit)

Part A

1. The unit of Peltier coefficient is……. (K2-U, CO-1)
2. Calculate the temperature of inversion of Cu-Fe thermocouple, if the cold junction is at 100^{o}C. (K4-An, CO-2)
3. Which of the following is a poor conductor of heat ? (K2-U, CO-3)

   a)Copper b) air c) aluminium d) all of these

4. In an isothermal process, the heat supplied to the ideal gas is equal to the work done by the gas. (State True/False) (K4-An, CO-4)
5. Who first introduced the concept of Entropy? (K2-U, CO-3)

Part B

6. Describe the principle and working of Platinum resistance thermometer.(K2-U, CO-1)
7. Describe Joly's differential steam calorimeter method to find Cv. (K2-U, CO-1)
8. Explain the principle and propagation of Rectilinear flow of heat along a bar with one end heated simultaneously. (K2-U, CO-1)
9. Derive the change of entropy when ice converted into steam. (K4-An, CO-4)
10. Differentiate extensive variable from the intrinsic variables. (K4-An, CO-4)

Part C

11. Describe the experimental details of Callender and Griffiths bridge and calculate the correction value. Give its advantage and disadvantages. (K2-U, CO-1)
12. How will you find specific heat capacity of gas in the Callender and Barnes continuous flow method? Explain in detail. (K2-U, CO-1)
13. How will you determine the specific heat capacity of a liquid using Joule's Electrical method? Explain. (K2-U, CO-3)
14. Derive the relation for change in entropy during the reversible process. (K5-E, CO-5)
15. Derive Maxwell's thermodynamic relations. (K5-E, CO-5)

Dr.C.Nirmala Louis
Head of the Department

Dr.M.Abila Jeba Queen
Course Instructor

Teaching Plan

Department : Physics
Class : II B.Sc. Physics
Title of the Course : Core III: Non-Conventional Energy Sources
Semester : III
Course Code : PC2032

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PC2032	4	-	-	4	4	60	30	70	100

Objectives

1. To provide an understanding of the present energy crisis and various available energy sources.
2. To make the students to understand the present day crisis of need for conserving energy and their alternatives.

Course outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO 1	Apply the solar energy in various sectors. (industry, agriculture and domestic purposes)	PSO - 3	Ap
CO 2	Explain the basic principles of wind energy conversion, various Biomass conversion Processes and its classification.	PSO - 1	U
CO 3	Discuss the geothermal energy resources and chemical energy resources. (fuel cells)	PSO - 2	An
CO 4	Solve the present and future energy crisis.	PSO - 8	C

Teaching plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/Evaluation
I	**Introduction to Energy Sources**					
	1	World's reserve of Commercial energy sources and their availability	**4**	K1(R)	PPT, Illustration and group discussion	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I
	2	-India's production and reserves	**3**	K4(Ap)	PPT, Illustration, design and group discussion	
	3	Conventional and non-conventional sources of energy, comparison – Coal- Oil and natural gas	**3**	K2(U)	PPT, Illustration and group discussion	
	4	applications - merits and demerits	**2**	K6(C)	Illustration, design and group discussion	
II	**Solar Thermal Energy**					
	1	Solar constant -Solar spectrum-Solar radiations outside earth's atmosphere –at the earth surface- on tilted surfaces	**3**	K2(U)	PPT, Illustration and group discussion	Evaluation through: Online quiz, short questions Descriptive answers Formative assessment I
	2	Solar Radiation geometry-Basic Principles of Liquid flat plate collector	**3**	K1(R)	PPT, Illustration and group discussion	
	3	Materials for flat plate collector - Construction and working- Solar distillation	**3**	K4(An)	PPT, Illustration and group discussion	
	4	Solar drying-Solar cooker (box type)- Solar water heating systems – Swimming pool heating.	**3**	K3(Ap)	PPT, Illustration and group discussion	

III	**Photovoltaic Systems**					
	1	Introduction- Photovoltaic principle- Basic Silicon Solar cell- Power output and conversion efficiency- Limitation to photovoltaic efficiency	**4**	K1 (R)	PPT, Illustration and group discussion	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I/II
	2	Basic photovoltaic system for power generation- Advantages and disadvantages. Types of solar cells	**4**	K4(An)	PPT, Illustration and group discussion	
	3	Application of solar photovoltaic systems - PV Powered fan – PV powered area - lighting system – A Hybrid System.	**4**	K6(Ap)	PPT, Illustration, group discussion and design of solar cell	
IV	**Biomass Energy**					
	1	Wind Energy Conversion- Classification and description of wind machines, wind energy collectors-Energy storage-- Energy from Oceans and Chemical energy resources	**4**	K1(R)	PPT, Illustration and group discussion	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment II
	2	Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation- Energy and power from waves- wave energy conversion devices- Fuel cells- and application of fuel cells	**5**	K3(Ap)	PPT, Illustration and group discussion	
	3	Batteries- advantages of battery for bulk energy storage- Hydrogen as	**3**	K6(C)	PPT, Illustration and group discussion	

		alternative fuel for motor vehicles			and design of batteries	
V	**Energy and Other Energy Sources**					
	1	Wind Energy Conversion-Classification and description of wind machines, wind energy collectors	**4**	K2(U)	Discussion PPT Circuit designing	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment II
	2	Energy storage--Energy from Oceans and Chemical energy resources-Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation	**4**	K3(Ap)	PPT, Illustration and group discussion	
	3	Energy and power from waves- wave energy conversion devices- Fuel cells- and application of fuel cells- batteries- advantages of battery for bulk energy storage- Hydrogen as alternative fuel for motor vehicles.	**4**	K6(C)	PPT, Illustration and group discussion and design of fuel cells	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Employability**

Activities (Em/ En/SD): **Project**

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Environment Sustainability

Activities related to Cross Cutting Issues :-

Assignment : (Mention Topic and Type): **Analysis of the nuclear power plant in India**

Seminar Topic: (if applicable): Analysis and design of solar panels

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. ___is the end product of natural process of decomposition of organic matter. **(K2- U, CO 1)**

2. State True / False. India's resources of uranium are extensive. **(K1- R, CO 1)**
3. The radiation received from the sun on the earth is _____.**(K2- U, CO 1)**

   a) parallel b) vertical

   c) perpendicular d) none of these

4. The maximum temperature obtained in a Parobolic disc concentrater type solar cooker is __
   a) 300°C
   b) 400°C
   c) 350°C
   d) 450°C
5. The most efficient solar cell is the cell formed by **(K2- U, CO 1)**

   a) pn homojunction b) pn heterojunction

   c) Schottkey junction d) None

Part B (4 marks)

1. Write a short note on Conventional and non-conventional sources of energy. **(K2- U, CO1)**
2. Write a short note on solar radiation at the earth surface. **(K2- U, CO1)**
3. With neat diagram explain the working of a PV powered fan. **(K6- 6, CO4)**
4. How is energy generated from Biomass? Brief out your answer. **(K2- U, CO1)**
5. Write a short note on different methods of OTEC generation. **(K2- U, CO1)**

Part C (8 marks)

1. What are the world's reserves of commercial energy sources? **(K2- U, CO1)**
2. What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere? **(K2- U, CO1)**
3. Obtain expressions for conversion efficiency and power output for photovoltaic devices and explain them. **(K5- E, CO3)**
4. Discuss the Bio-mass conversion technologies. **(K3- Ap, CO1)**
5. With a neat diagram explain the basic components of WECS. **(K2- U, CO1)**

Ms.Jenepha Mary

Head of the Department Course Instructor

Teaching Plan

Department : Physics
Class : II B.Sc Chemistry
Title of the Course : Allied Physics I for Chemistry
Semester : III
Course Code : AP2031

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
AP2031	4	-	-	3	4	60	40	60	100

Objectives

1. To understand the concept of strength of materials, viscous properties of Liquids, heat transformation from one place to another, converting heat to do mechanical work.
2. To understand basic properties of light such as interference and diffraction.

Course outcomes

CO	Upon completion of this course the students will be ableto:	PSO addressed	CL
CO – 1	Understand the fundamental concepts of Physics.	PSO-1	U
CO – 2	Analyse the concepts and study the applications of Thermodynamics, material properties heat and optics.	PSO-2	An
CO – 3	Apply their depth knowledge of Physics in day today life.	PSO-3	Ap
CO – 4	Develop their knowledge and carry out the practical by applying these concepts	PSO-5	R

Teaching plan

Allied Physics - I for Chemistry

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/Evaluation
I	**Properties of Matter**					
	1	Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition alone)	**2**	K1(R)	Illustration and lecture	Evaluation through: quiz, short questions Multiple Choice, questions . Deriving theoretical Formulas Problem solving Formative assessment
	2	Bending of beams – Expressionfor bending moment	**1**	K2(U)	Illustration and theoretical derivation	
	3	Determination of Young' modulus – uniform and non uniform bending. Expression for Couple per unit twist	**2**	K2(U)	Illustration, theoretical derivation and Practical	
	4	Work done in twisting a wire – Torsional oscillations of a body– Rigidity modulus of a wire and M.I. of a disc by torsion pendulum	**3**	K2(U)	Lecture and theoretical derivation	
II	**Conduction in solids**					
	1	Thermal Conductivity – Lee's disc method – Relation	**2**	K1(R)	Lecture discussion with illustration	Multiple choice, questions,

		between thermal and electrical conductivities.				Deriving theoretical formulas Formative assessment
	2	Widemann – Franzlaw – Convection:	**1**	K2(U)	Illustration, theoretical derivation and Demonstration	
	3	Newton's law of cooling – Determination of specific heat capacity of liquid	**1**	K3(Ap)	Lecture Illustration	
	4	Radiation: Distribution of energy in the spectrum of black body - Results	**2**	K3(Ap)	Lecture Discussion	
III	**Viscosity**					
	1	Viscosity – Viscous force – Co- efficient of viscosity – Units and dimensions	**3**	K1(R)	Illustration, Theoretical formulation Problem solving	Evaluation through: quiz, short test Assignment on applications. Problem Solving Formative assessment
	2	Poiseuille's formula for co-efficeint of viscosity of a liquid – determination of coefficient of viscosity using burette and comparison of viscosities.	**3**	K2(U)	Illustration, Theoretical formulation Practical demonstration	
	3	Bernoulli's theorem – Statement and proof – Venturimeter – Pitot tube.	**2**	K3(Ap)	Lecture, Illustration, Theoretical formulation Practical	
IV	**Thermodynamics**					
	1	Zeroth and First Law of thermodynamics – Second law of thermodynamics	**2**	K2(U)	Lecture, Demonstration, theoretical formulation	Evaluationthrough: quiz, shortquestions Multiple choice, questions, Deriving theoreticalformulas

	2	Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine	**3**	K3(Ap)	Lecture, Demonstration, theoretical formulation	Formative assessment
	3	Entrophy – Change in entropy in reversible and irreversible process – change in entropy of a perfect gas – change in entropy when ice is converted into steam.	**3**	K4(An)	Lecture, Demonstration, theoretical formulation	
V	**Optics**					
	1	Interference – conditions for interference maxima and minima – Air wedge – thickness of a thin wire – Newton's rings – determination of wavelength using Newton's rings.	**3**	K1(R)	Illustration, Theoretical formulation Demonstration	Evaluationthrough: quiz, Deriving theoreticalformulas Assignment on application Formative assesment
	2	Diffraction – difference between diffraction and interference – Theory of transmission grating – normal incidence.	**4**	K1(R)	Lecture Demonstration Theoretical formulation	
	3	Optical activity – Biot's laws – specific rotatory power – determination of specific rotator power using Laurent's half shade polarimeter.	**4**	K2(U)	Lecture Demonstration Theoretical formulation	

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Employability**

Activities (Em/ En/SD): P**racticals**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Nil

Activities related to Cross Cutting Issues: Nil

Assignment: (Mention Topic and Type): **Zeroth and First law of Thermodynamics.**

Seminar Topic: (if applicable): **Nil**

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. The ratio of volume stress to volume strain is called-------**(K2- U, CO 1)**
   Bulk modulus (b) rigidity modulus (c) young's modulus (d) all the above
2. The coefficient of convection is defined as the ratio**(K1- R, CO 4)**
   a) C = $\frac{H\theta}{A}$ b) C = $\frac{A\theta}{4}$ c) C = $\frac{H}{A}$ d) C = $\frac{H}{A\theta}$
3. Double refraction does not take place**(K4- An, CO 2)**
   (a) in quartz (b) in calcite (c) in water (d) none of the above
4. Newton's law of cooling can be used to determine the **(K3- Ap, CO 3)**
   a) Specific heat capacity of gases b) Specific heat capacity of liquid
5. c) Specific heat capacity of solids d) Specific heat capacity of solid, liquid gases
   What is the velocity of the liquid along the axis of the tube? **(K2- U, CO 1)**
   a) Zerob) minimum c) maximum d) gradient variation

Part B (3 marks)

6. Compare different Modulus of Elasticity? **(K2- U, CO 1)**
7. Experiment Newton's law of cooling and verify it. **(K3- Ap, CO 3)**
8. Examine the coefficient of viscosity of a liquid by a variable pressure head method. **(K4- An, CO 2)**
9. Examine zeroth law of thermodynamics and prove it. **(K4- An, CO 2)**
10. Define Stoke's law. Give the condition for maxima and minima. **(K1- R, CO 4)**

Part C (7 marks)

11. With neat diagram explain the theory of Non-uniform bending for a beam of rectangular cross section.**(K3- Ap, CO 3)**
12. Examine Lee's disc method for finding the coefficient of thermal conductivity for bad conductors. **(K4- An, CO 2)**
13. With the help of Bernoulli's theorem and explain the working of the Pitot tube. **(K3- Ap, CO 3)**
14. Illustrate the change of entropy when ice is converted into steam.**(K2- U, CO 1)**
15. Analyze how you will determine the specific rotatory power using Laurent's half shade polarimeter.**(K4- An, CO 2)**

Sr.S.Sebastiammal

Head of the Department Course Instructor

DEPARTMENT OF PHYSICS

HOLY CROSS COLLEGE (Autonomous), Nagercoil-629004

III BSc Physics

Teaching Plan

Semester V

Major Core –V

Name of the Course : Classical and Statistical Mechanics

Subject code : PC2051

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To understand the mechanics of systems of particles and their equations of motion
2. To study the concept of statistics of molecules.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO- 1	understand the basic mechanical concepts related to system of particles	PSO-1	U
CO-2	apply various mechanical principles to find solution for physical problem	PSO-4	Ap
CO- 3	solve the equations of motion using Hamiltonian formalism	PSO-6	C
CO- 4	explain the fundamental postulates of statistical mechanics and Maxwell Boltzmann statistics	PSO-1	R
CO- 5	understand and develop a scientific knowledge in quantum statistics	PSO-7	U

Modules

Credits: 5 **Total contact hours: 90 (Including assignments and tests)**

Unit	Section	Topics	Lecture hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Mechanics of a System of Particles**					
	1	External and internal forces, center of mass	4	K1(R)	Lecture Discussion with PPT illustration	Evaluation through: Online quiz, short questions Descriptive answers MCQ, Problem solving. True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I
	2	Conservation of linear momentum- Conservation of angular momentum- Conservation of energy- work- energy theorem-	5	K1(R)	Lecture discussion	
	3	Conservative forces- examples- Constraints-Types of constraints- Examples- Degree of freedom-	5	K2(U)	Lecture discussion	
	4.	Generalized coordinates (transformation equations) – Generalized Velocities- Generalized Momentum.	4	K2(U)	Lecture discussion, PPT	
II	**Lagrangian Formulations**					
	1	Principle of virtual work, D'Alembert's principle	4	K2(U)	Lecture Discussion with PPT Illustration	Evaluation through: Online quiz, short questions Descriptive answers
	2	Lagrange's equation of motion for	4	K3(Ap)	Lecture discussion	

		conservative and non conservative systems				MCQ, Problem solving. True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I
	3	Simple applications- simple pendulum- Atwood's machine- compound pendulum	5	K3(Ap)	PPT, Illustration, Theoretical formulation , Derivation	
	4	Hamilton's principle- Deduction of Lagrange's equation of motion from Hamilton's principle - Deduction of Hamilton's principle from D'Alembert's principle	5	K3(Ap)	PPT, Illustration, Theoretical formulation , Derivation	
III	**Hamiltonian Formulations**					
	1	Phase space- The Hamiltonian function H- Hamilton's Canonical equation of motion	6	K2(U)	Lecture with PPT Illustration	Evaluation through: Online quiz, short questions Descriptive answers MCQ, Problem solving. True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I/II
	2	Physical significance of H-Deduction of Canonical equation from a variational principle	6	K3(Ap)	Question-answer session Lecture	
	3	Applications- Harmonic Oscillator- Planetary motion- Compound pendulum	6	K4(An)	PPT, Illustration, Theoretical formulation , Derivation	
IV						
	1	Micro and macro states- The mu-space and gamma space- fundamental postulates of statistical mechanics	6	K1(R)	Lecture Discussion	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Short essays,
	2	Ensembles- different types- Thermo	6	K2(U)	Lecture	

		dynamical probability - entropy and probability			Discussion	Concept explanations, Short summary or overview Formative assessment II
	3	Boltzmann's theorem- Maxwell- Boltzmann statistics- Maxwell-Boltzmann energy distributive law- Maxwell- Boltzmann velocity distributive law.	6	K3(Ap)	PPT, Illustration, Theoretical formulation , Derivation	
V	**Quantum Statistics**					
	1	Development of Quantum statistics- Bose- Einstein and Fermi- Dirac statistics-	5	K2(R)	PPT, Illustration, Theoretical formulation , Derivation	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment II
	2	Derivation of Planck's radiation formula from Bose–Einstein statistics ,	5	K2(U)	PPT, Illustration, Theoretical formulation , Derivation	
	3	Free electrons in metal- Fermi Gas- Difference between classical and quantum statistics	4	K4(An)	PPT, Illustration, Theoretical formulation , Derivation	
	4	Free electrons in metal- Fermi Gas- Difference between classical and quantum statistics	4	K3(Ap)	Lecture, ppt Illustration, Theoretical formulation ,	

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Employability**

Activities (Em / En /SD): **Problem solving, Discussion**

Course Focussing onCross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Environment Sustainability activities related to Cross Cutting Issues :-

Assignment: (Mention Topic and Type): Problem solving

Seminar Topic: (if applicable): Analysis of different types of statistics

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. Force on the system is zero, its total linear momentum is constant.(True/False) **(K2-U, CO1)**
2. Virtual work done by all the applied forces must be zero under the condition that the virtual work done by the constraint forces is also zero. True / False. **(K3- Ap, CO2)**
3. The equation of motion of a simple pendulum is _____ **K3 – Ap, CO2)**
4. Analyze the thermodynamic probability in the equilibrium state ------ **(K4-An,CO3)**
5. The statistics which obeys Pauli's exclusion principle is known as ---------- **(K5-E, CO4)**

Part B (4 marks)

1. Estimate that for a conservative force (K2- U, CO1)

   i. $\oint F.dr = 0$

   ii. Curl F = 0

2. Produce an expression for D'Alemberts principle of virtual work. (K3 – Ap, CO2)

3. Compose the equation of motion for a compound pendulum. (K6- C, CO3)

4. Compare and contrast M-B statistics, F-D statistics and B-E staistics.K5- E, CO3)

5. Distinguish classical and quantum statistics. (K2- U, CO5)

Part C (8 marks)

1. Discuss that the angular momentum of a system of particles is conserved. (K2 – U,CO1)

2. Illustrate the Lagrangian equation of motion using D'Alemberts principle.a. (K3 – Ap, CO2)

3. Formulate the Hamiltonian function for linear harmonic oscillator. (K6- C, CO3)

4. Evaluate an expression for the distribution of ni particles in the energy levels (Ei) by using Maxwell- Boltsman statistics (K5- E, CO2)

5. Evaluate the expression for Planck's radiation formula from Bose– Einstein statistics

Course instructors: Dr.A.Lesly Fathima and Dr.S.J Jenepha Mary

Head of the Department: Dr. C. Nirmala Louis

Teaching Plan

Department : Physics
Class : III B.Sc Physics
Title of the Course : Major Core- VI- Analog Electronics
Semester : V
Course Code : PC2052

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PC2052	6	-	-	5	6	90	25	75	100

Objectives

1. To impart in depth knowledge about Semiconductors, Diodes, Transistors, Operational Amplifiers, Oscillators etc
2. To enable the students to understand the aspects of analog electronics in a lucid and comprehensive manner.

Course outcomes

CO	Upon completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO - 1	understand the fundamental principles of semiconductors including P-N junctions and zener diode	PSO-1	K2
CO - 2	illustrate network theorems like Thevenin's theorem, Norton's theorem etc.,	PSO-2	K2
CO - 3	analyze the operation of transistor , amplifier, oscillator and multivibrator	PSO-3	K5
CO - 4	demonstrate practical skills in the simulation, construction and testing of simple electrical and electronic circuits.	PSO-6	K3

Teaching plan

Total Contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive Level	Pedagogy	Assessment/ Evaluation
I	**Linear circuit analysis and semiconductor diodes**					
	1	Constant voltage source - constant current source - Maximum power transfer theorem - Thevenin's theorem - procedure for finding Thevenin Equivalent circuit	5	K3 (Ap)	Lecture, Group Discussion and Problem Solving	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept explanations, Formative assessment I
	2	PN junction theory - V-I characteristics of a PN junction diode - Half wave rectifier - Bridge rectifier - Efficiency	5	K3 (Ap)	Lecture, Group Discussion and Problem Solving	
	3	filters - Shunt capacitor filter – pi filter - Zener diode - equivalent circuit - voltage regulator	4	K3 (Ap)	Lecture, Group Discussion and Problem Solving	
	4	LED - V-I characteristics – advantages - applications - photo diode - characteristics applications	4	K2 (U)	Group Discussion and lecture	
II	**Transistor Amplifier**					
	1	Transistor - Different modes of operations-CB mode & CE mode	4	K2 (U)	Demonstration and lecture	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept explanations, Formative assessment I
	2	Two port representation of a transistor- h parameter - AC equivalent circuit using h parameters- analysis of amplifiers using h parameters (CE only)	4	K3 (Ap)	demonstration and lecture – cum-discussion, Problem Solving	
	3	RC coupled amplifier - transformer coupled amplifier	3	K4 (An)	Lecture-cum-Discussion and Demonstration	
	4	Power amplifier	1	K4 (An)	Lecture- cum-discussion	
	5	Classification of amplifiers - Class A, Class B and Class C	4	K4 (An)	Group Discussion and lecture	Multiple choice, questions,

	6	Push pull amplifier – Emitter follower	2	K4(An)	Lecture, Group Discussion	Formative assessment
III	**Oscillators and Multivibrator**					
	1	Principle -effect negative feedback-and Barkhaussen criterion	4	K5(E)	Lecture-cum-discussion, Problem solving	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept explanations, Formative assessment I
	2	Phase shift and Wien Bridge oscillators using transistors – Expression for frequency	5	K5 (E)	Lecture, Group discussion, Problem solving	
	3	Multivibrators- Astable and ,Monostable	4	K4 (An)	Demonstration, Lecture-cum-discussion	
	4	Bistable multi vibrators using transistors - Schmitt trigger.	5	K4 (An)	Demonstration, Lecture-cum-discussion	
IV	**Special Semiconductor Devices**					
	1	Clipping and clamping circuits	3	K4 (An)	Lecture-cum-discussion, PPT	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept explanations, Formative assessment I
	2	Differentiating circuit - Integrating circuit	4	K4 (An)	Lecture, Demonstration, Group discussion	
	3	Field effect Transistor FET-MOSFET	4	K4 (An)	Lecture-cum-discussion	
	4	UJT-SCR -characteristics - FET as a VVR	4	K4 (An)	Lecture-cum-discussion	
	5	UJT relaxation oscillator-SCR as a switch and rectifier	3	K4 (An)	Lecture-cum-discussion	
V	**Operational Amplifier**					
	1	Operational Amplifier-characteristics-parameters-applications- Inverting amplifier - Non inverting amplifier	5	K2 (U)	Lecture-cum-discussion, Demonstration	Evaluation through: Online quiz, short questions Descriptive answers MCQ, True/False, Concept
	2	Voltage follower- Adder - Subtractor - Integrator – Differentiator	5	K2 (U)	Lecture-cum-discussion, Demonstration	
	3	Solving simultaneous	4	K3 (Ap)	Lecture-cum-	

		equations-comparator -square wave generator			discussion, Demonstration	explanations,
	4	Wien bridge oscillator -Schmitt trigger	4	K2 (U)	Lecture-cum-discussion, Demonstration	Formative assessment I

Course Focussing on Employability/ Entrepreneurship / Skill Development: **Skill Development**

Activities (Em/ En/SD): **Project**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment

Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues: -

Assignment: (Mention Topic and Type): Problems in Linear circuit Analysis

Seminar Topic: (if applicable): -

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. Which one of the following is an example of alternating voltage source? **(K2-U, CO-2)**
   a) dc generator b) ac generator
   c) cells d) battery
2. The current amplification factor is given by ----------**(K5-E, CO 3)**
3. An oscillator converts _____**(K2-U, CO-1)**
   a. a.c power into d.c power b. d.c power into a.c power
   c. mechanical power into a.c power d. none of the above
4. Astable multivibrator continuously produces the square wave output, it is referred as ---------- multivibrator.(**K2-U, CO-1)**
5. In integrated chip 741, the pin 2 denotes_____ **(K2-U, CO-1)**
   a) - Vcc b) off set null
   c) non- inverting input d) inverting input

Part B (4 marks)

1. An audio amplifier produces an alternating output of 12 V before the connection to a load. The amplifier has an equivalent resistance of 15Ω at the output. What resistance the load need to have to produce maximum power? Also calculate the power output under this condition. **(K5-E, CO-3)**
2. Describe Push pull amplifier. **(K3-Ap, CO4)**
3. Compute the nature of the oscillations produced by tank circuit. **(K3-Ap, CO-4)**
4. Recognize FET as a VVR. **(K2-U, CO-2)**
5. Explain briefly the integrator. **(K2-U, CO-2)**

Part C (8 marks)

1. A generator develops 200V and has an internal resistance of 100Ω. Find the power delivered to a load of (i) 100 Ω (ii) 300Ω. Comment on the result. **(K5-E, CO-3)**
2. Compare RC Coupled amplifier and transformer coupled amplifier. **(K4-An, CO-3)**
3. Differentiate the three types of Multivibrators in detail. **(K2-U, CO-2)**
4. Outline Field Effect Transistor and explain MOSFET.**(K2-U, CO 2)**

5. Discuss in detail about the Voltage follower**. (K2-U, CO-2)**

Head of the Department **Course Instructor**

Dr. C. Nirmala Louis **Dr. M. Priya Dharshini & Dr. R. Krishna Priya**

Teaching Plan

Department : Physics
Class : III B.Sc Physics
Title of the Course : Core VII: Solid State Physics
Semester : V
Course Code : PC2053

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PC2053	5	-	-	5	5	75	30	70	100

Objectives

- To impart knowledge on the structure of crystals and the different types of materials.
- To develop a scientific attitude at micro and nano scales of materials

Course outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	illustrate various types of bonding present in solids with example.	PSO - 1	U
CO - 2	explain the various crystal parameters and structures.	PSO - 3	E
CO - 3	discuss the various theories involved in magnetic materials. (dia, para, ferro, ferri and antiferro magnetism)	PSO - 3	C
CO - 4	describe polarization processes and analyze the information contained in the temperature and frequency dependence of dielectric materials.	PSO - 1	C
CO - 5	analyze the structure and physical properties of semiconductors.	PSO - 5	An
CO - 6	describe and discuss the theory of superconductivity and superconducting materials.	PSO - 2	C

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/Evaluation
I	**Bonding in Solids**					
	1	Types of bonds in crystals - Ionic, covalent, Metallic, Vander waal's and Hydrogen Bonding	**4**	K1(R)	PPT, Illustration and theoretical derivation,	Evaluation through: Online quiz, Problem solving short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I
	2	Bond energy of sodium chloride molecule - variation of inter atomic force with inter atomic spacing	**4**	K3(Ap)	Derivation and group discussion, block diagram	
	3	Cohesive energy - cohesive energy of ionic solids - application to sodium chloride crystal	**3**	K6(C)	PPT, Illustration, Theoretical formulation Discussion and Problem Solving	
	4	Evaluation of Madelung constant for sodium chloride	**4**	K5(E)	Derivation and group discussion Problem Solving	
II	**Crystal Structure and Crystal Diffraction**					
	1	Crystal Lattice -Primitive and unit cell-seven classes of crystal-Bravais Lattice- Miller Indices	**4**	K2(U)	PPT, Derivation discussion Demonstration	Evaluation through: Online quiz, Problem solving short questions

	2	Crystal Diffraction – Bragg's Law	**4**	K4(An)	Derivation and group discussion problem solving	Descriptive answers Formative assessment I
	3	Experimental methods-Laue method, powder method and rotating crystal method	**3**	K3(A)	Illustration, Theoretical formulation PPT, Derivation discussion Demonstration	
	4	Reciprocal lattice- Intensity and structure factor.	**4**	K5(E)	Derivation and group discussion problem solving	
III	**Magnetic Properties**					
	1	Spontaneous Magnetization – Weiss Theory – Temperature dependence of Magnetization	**4**	K3(Ap)	PPT, Illustration and theoretical derivation,	Evaluation through: Online quiz, Problem solving short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I/II
	2	Classical Theory of Diamagnetism	**4**	K2(U)	Derivation and group discussion, block diagram	
	3	Weiss theory of Para magnetism– Ferromagnetic domains – Bloch wall	**3**	K6(C)	Derivation and group discussion, PPT Block diagram designing	
	4	Basic ideas of anti-ferromagnetism – Ferri magnetisms – Ferrites in computer Memories.	**4**	K4(An)	PPT, Illustration, Theoretical formulation	
IV	**Dielectric Properties**					

	1	Band theory of solids – classification of insulators, Semiconductors , conductors	**4**	K1(R)	Derivation discussion PPT, Illustration, Theoretical formulation	Evaluation through: Online quiz, Problem solving short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment II
	2	Intrinsic and extrinsic semiconductor Carrier concentration for electron - Barrier Potential	**4**	K5(E)	Derivation and group discussion, PPT Block diagram designing	
	3	Calculation Rectifier Equation Dielectrics - Polarization – frequency and temperature effects on polarization	**4**	K3(Ap)	Derivation and group discussion Block diagram designing	
	4	Dielectric loss-Clausius Mosotti relation-determination of dielectric constants.	**3**	K6(C)	Derivation and group discussion Block diagram designing	
V	**SuperConductivity**					
	1	Introduction - General Properties of Superconductors - effect of magnetic field	**4**	K2(U)	Discussion PPT Block diagram designing	Evaluation through: Online quiz, Problem solving short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview
	2	Meissner effect-effect of current-thermal properties-entropy-specific heat -	**4**	K1(R)	Derivation and group discussion, PPT Block diagram designing	

		energy gap - isotope effect				Formative assessment II
	3	London equations - AC & DC Josephson effects - applications- Type–I and Type–II Superconductors	**4**	K3(Ap)	Derivation and group discussion Block diagram designing	
	4	- Explanation for the Occurrence of Super Conductivity - BCS theory - Application of Superconductors - High T_C superconductors.	**3**	K5(E)	Derivation and group discussion, PPT	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Employability**

Activities (Em/ En/SD): **Project**

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues :-

Assignment : (Mention Topic and Type): **Application of Superconductors - High $T_C$superconductors -descriptions through Google Classroom**

Seminar Topic: (if applicable): -

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. A _____is formed by sharing of valence electrons between themselves. **(K5- E, CO 2)**
   a) Ionic bonds b) covalent bond c) metallic bond d) Hydrogen bond
2. The expression for Bragg's Law is $n\lambda =$ _____. **(K2- U, CO 1)**
   a) $d \sin\theta$ b) $d \cos\theta$ c) $2d \sin\theta$ d) $2d \cos\theta$
3. Ferromagnetic materials exhibits magnetization even after the applied field is removed. Say True or False. **(K5- E, CO 2)**
4. At high temperature, the ionic polarizability decreases. Say true or false. **(K2- U, CO**
5. In general, superconductors are **(K4- An, CO 5)**

a) Ferromagnets b) Antiferromagnets c) diamagnets d) paramagnets

Part B (4 marks)

6. Compare primary and secondary bonds .Give examples. **(K5- E, CO 3)**
7. Outline the applications of powder Xray Diffraction method. **(K2- U, CO 1)**
8. Explain about the ferrimagnetism **(K2- U, CO 1)**
9. What do you understand by intrinsic and extrinsic semiconductors? **(K6- C, CO 4)**
10. Derive the London equations in superconductors **(K4- An, CO 5)**

Part C (8 marks)

11. Elaborate cohesive energy and derive an expression for the cohesive energy **(K6- C, CO 4)**
12. Interpret the seven crystal system with neat diagram **(K5- E, CO 3)**
13. Describe the classical theory of diamagnetism **(K6- C, CO 4)**
14. Discuss band theory of solids using energy band diagram. Discuss its bandgap dependence. **(K4- An, CO 5)**
15. Discuss the outstanding contributions of BCS theory and list its limitations. **(K5- E, CO 3)**

Ms.C.Nirmala Louis & Ms.JV.Shally

Head of the Department Course Instructor