Holy Cross College (Autonomous), Nagercoil

Kanyakumari District, Tamil Nadu.

Accredited with A^+ by NAAC - IV cycle – CGPA 3.35

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

DEPARTMENT OF PHYSICS

TEACHING PLAN

ODD SEMESTER 2024 -2025

Vision

Envisions training students for quality Physics education and holistic development empowered to meet challenges and embark on luxuriant careers.

Mission

- To produce competent graduates infused with professionalism, ethical values and social responsibility.
- To prepare students to accentuate learning for life.
- To foster a research environment, to keep up with global development in Science.
- To evolve strategies for the growth of the department towards excellence.

Programme Educational Objectives (PEOs)

PEOs	Upon completion of B.A/B.Sc. degree programme, the graduates will be able to	Mission addressed
PEO 1	apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	**M1& M2**
PEO 2	inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services.	**M2, M3, M4 & M5**
PEO 3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	**M3, M4, M5 & M6**

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	Mapping with PEOs
PO1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	**PEO1**
PO2	create innovative ideas to enhance entrepreneurial skills for economic independence.	**PEO2**
PO3	reflect upon green initiatives and take responsible steps to build a sustainable environment.	**PEO2**
PO4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	**PEO1 & PEO3**
PO5	communicate effectively and collaborate successfully with peers to become competent professionals.	**PEO2 & PEO3**

PO6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	**PEO2 & PEO3**
PO7	participate in learning activities throughout life, through self-paced and self-directed learning to improve knowledge and skills.	**PEO1 & PEO3**

Programme Specific Outcome (PSOs)

PSOs	**Upon completion of B.Sc. Physics Degree Programme, the graduates of Physics will be able to:**	**Mapping with POs**
PSO - 1	understand the core theories and principles of physics which include mechanics, thermodynamics, electronics, material science etc.	**PO1**
PSO - 2	develop extensive comprehension of fundamental and diverse applications of Physics.	**PO2 & PO3**
PSO - 3	apply knowledge of principles, concepts in Physics and analyze their local, national and global impact. Apply the critical reasoning and computing skills to analyze and solve problems in physics.	**PO4 & PO5**
PSO - 4	analyze the observed experimental data and relate the results with theoretical expectations. Communicate appropriately and effectively, in a scientific context using present technology.	**PO6**
PSO - 5	develop entrepreneurial skills, empowered according to the professional requirement and become self-dependent. Understand the professional, ethical, legal, security, social issues and responsibilities.	**PO5 & PO7**

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. A. Lesly Fathima & 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 : PU231EC1

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

Teaching Plan

Department : Physics
Class : II B.Sc. Physics
Title of the Course : Core Course: III General Mechanics and Classical Mechanics
Semester : III
Course Code : PU233CC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU233CC1	5	–	–	–	5	5	75	25	75	100

Objectives

1. To have a basic understanding of the laws and principles of mechanics and to apply the concepts of forces existing in the system;
2. To understand the forces of physics in everyday life and to apply Lagrangian equation to solve complex problems.

Course Outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	recognize Newton's Law of motion, general theory of relativity, Kepler's laws and the basic principles behind planetary motion.	PSO - 1	K1(R)
CO-2	infer the knowledge on the conservation laws.	PSO - 1	K2(U)
CO-3	relate conservation law and calculate energy of various systems, understand and differentiate conservative and non–conservative forces.	PSO - 3	K3(Ap)
CO-4	devise concepts of rigid body dynamics and solve problems.	PSO - 3	K4(An)
CO-5	defend Lagrangian system of mechanics and D' Alembert's principle.	PSO - 2	K5(E)

Teaching plan

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

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**LAWS OF MOTION**					
	1.	Newton's Laws– Forces- Equations of motion – Motion of a particle in an uniform gravitational field	3	K1(R)	Lecture, Illustration and PPT using gamma	Evaluation through: quiz nearpod.
	2.	Kepler's laws-Newton's law of gravitation– Determination of G by Boy's method	3	K2(U)	Illustration, PPT	Formative assessment
	3.	Earth–moon system– Earth satellites –Earth density – mass of the Sun	3	K2(U)	Lecture Discussion using gamma	Evaluation through short test using nearpod
	4.	Gravitational potential – Velocity of escape – Einstein's theory of gravitation-Introduction	3	K1(R)	Illustration and AI tool	Solving simple problems
	5.	Principle of equivalence– Gravitational red shift – Bending of light.	3	K2(U)	Lecture Discussion using gamma	Evaluation through: quiz using hot potatoes.
II	**CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM**					
	1	Conservation of linear and angular momentum– Internal forces and momentum conservation – Centre of mass – Examples	4	K2(U)	Lecture, Illustration	Evaluation through: quiz using hot potatoes
	2	General elastic collision of particles of different masses– System with variable mass– Examples	4	K2(U)	Lecture Discussion using PPT	Class test Solutions to problems
	3	Conservation of angular momentum– Torque due to internal forces – Torque due to gravity	4	K3(Ap)	Lecture , llustration using AI tool	Evaluation through short test using nearpod
	4	Angular momentum about centre of mass – Proton	3	K3(Ap)	Lecture Discussion	Evaluation through

		scattering by heavy nucleus.			using gamma	short test using nearpod
III	**CONSERVATION LAWS OF ENERGY**					
	1.	Introduction – Significance of conservation laws – Law of conservation of energy .	4	K2(U)	Introductory session, Lecture using Chalk and talk , PPT.	Evaluation through short test, MCQ, True/False, Short essays.
	2.	Work – Power – Work – Kinetic energy theorem– Work done in lifting and lowering an object .	3	K3(Ap)	Lecture using Chalk and talk , Problem Solving, PPT.	Concept definitions, MCQ.
	3.	Conservative forces – Work done by spring force – Work done by the gravitational force.	3	K3(Ap)	Lecture using Chalk and talk , Problem Solving, PPT.	Evaluation through short test, Long derivation.
	4.	Gravitational potential energy and elastic potential energy	3	K3(Ap)	Lecture using Chalk and talk , Problem Solving, PPT.	Evaluation through short test, Long derivation.
	5.	Examples Non–conservative forces	2	K2(U)	Lecture using Chalk and talk , Problem Solving, PPT.	Evaluation through short test, MCQ, True/False, Short essays.
IV	**RIGID BODY DYNAMICS**					
	1.	Translational and rotational motion – Angular momentum.	4	K2(U)	Introductory session, Lecture using Chalk and	Evaluation through short test, MCQ, True/False,

					talk , PPT.	Short essays.
	2.	Moment of inertia – General theorems of moment of inertia – Examples	3	K4(An)	Lecture using videos, Problem solving, Demonstration.	Concept definitions, MCQ.
	3.	Rotation about fixed axis – Kinetic energy of rotation – Examples	3	K4(An)	Lecture using videos, Problem solving, Demonstration.	Evaluation through short test, MCQ, True/False.
	4.	Body rolling along a plane surface – Body rolling down an inclined plane	3	K4(An)	Lecture using videos, Problem solving, Demonstration.	Evaluation through Definition, Derivation Test
	5.	Gyroscopic precision – Gyrostatic applications.	2	K4(An)	Lecture using videos, Problem solving, Demonstration.	Evaluation through short test
V	**LAGRANGIAN MECHANICS**					
	1	Generalized coordinates – Degrees of freedom – Constraints-Holonomic and non–holonomic – Scleronomic and Rheonomic constraint	5	K2(U)	Lecture Illustration ,	Evaluation through: quiz, Formative Assessment
	2	Principle of virtual work and D' Alembert's Principle	3	K4(U)	Illustration	Evaluation through short test
	3	Lagrange's equation from D' Alembert's principle	3	K3(Ap)	Lecture Discussion using gamma	Class test Solutions to problems
	4	Application – Simple pendulum – Atwood's machine.	4	K5(E)	Lecture ,Illustration using slido	Class test Solutions to problems

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

Activities (Em / En /SD): Hands on Training on Problem solving

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

Assignment: Find out the Kinetic Energy of a Body rolling along a plane surface.

Seminar Topic: (if applicable):-

Sample questions (minimum one question from each unit)

Part A (1mark)

1. A ball thrown vertically upwards falls at the same place. What is the displacement of the ball.**(K4-An, CO-4)**
2. In the electromagnetic spectrum ----- has the high penetrating power**(K2-U, CO-2)**
3. Which of the following is not a conservative force? **(K1-R, CO-1**)
   a)Gravitational b)Frictional c)Electrostatic d)Nuclear
4. What will be the radius of gyration of a circular plate of diameter 10cm? **(K4-An,CO-4)**
   a) 1.5cm b) 2.0cm c) 2.5cm d) 3cm
5. Evaluate the number of degrees of freedom for a system consisting of N number of particles(**K5-E, CO4)**

Part B Part B (4 marks)

1. Briefly explain Newton's laws of motion. **(K1-R, CO-1)**
2. Explain motion and derive an expression for the equations of motion.**(K2-U, CO-1)**
3. Calculate the work done by a spring force. **(K3-Ap,CO3)**
4. Compare translational and rotational motion. **(K4-An, CO-4)**
5. Evaluate Lagrange's Equation. **(K5-E, CO-5)**

Part C Part C (8 marks)

1. Determination the gravitational constant G by Boy's method (**K1-R, CO-1)**
2. Derive an expression between torque and moment of inertia .**(K2-U, CO-2)**
3. Calculate the work done in lifting and lowering an object by applying kinetic energy theorem. **(K3-Ap, CO-3)**
4. Analyse the concept "Body rolling down an inclined plane" and find out its Kinetic energy. **(K4-An, CO-4)**
5. Explain the principle of virtual work and D' Alembert's Principle**(K2-U, CO-1)**

Dr. C. NIRMALA LOUIS, M.Sc., Ph.D., PGDCA
Head & Assistant Professor,
PG & Research Department of Physics,
Holy Cross College (Autonomous),
Nagercoil, Kanyakumari District,
Tamil Nadu, PIN: 629 004.

Head of the Department

Course Instructors

Teaching Plan

Department : Physics
Class : II B.Sc. Physics
Title of the Course : Skill Enhancement Course SEC -II Astrophysics
Semester : III
Course Code : PU233SE1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU233SE1	2	-	-	-	2	2	30	25	75	100

Objectives

1. To introduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena.
2. To provide an understanding of the physical nature of celestial bodies.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall the total and annular solar and lunar eclipses.	**K1**
2.	summarize the different layers of the Sun and its phenomenon.	**K2**
3.	articulate the basic concepts of Solar systems on planetary motion.	**K3**
4.	relate the distinct properties of planets revolving around the sun.	**K4**
5.	grade the principle of planetary motion towards science and technology.	**K5**

Teaching plan

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

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**THE SUN**					
	1.	The Sun – A typical star – Photosphere – Limb darkening .	2	K2(U)	Lecture, Illustration with PPT and videos.	Evaluation through: quiz, Schematic Representations, Formative assessment

	2.	Chromosphere – Spicules – Plages and filaments .	2	K2(U)	Illustration with PPT and videos.	Evaluation through: quiz, Schematic Representations, Formative assessment
	3.	Solar corona – The inner corona – The outer corona – The emission corona - prominences – sunspots - solar flares	2	K4(Ap)	Illustration with PPT and videos.	Evaluation through: quiz, Schematic Representations, Formative assessment
II	**SOLAR SYSTEM**					
	1	Comets – Nucleus – Coma – Hydrogen cloud – Dust tail – Ion tail - Asteroids – Debris – Meteors .	3	K4(An)	Illustration with PPT and videos.	Evaluation through: quiz using hot potatoes, class test
	2	Shooting stars – Falling stars – Meteoroids – Crater - Kuiper belt.	2	K3(Ap)	Lecture Discussion using PPT	Evaluation through: quiz using hot potatoes, class test
	3	Oort cloud - Bode's law of planetary distances	1	K3(Ap)	Illustration with PPT and videos.	Evaluation through: quiz using hot potatoes, class test
III	**ECLIPSES**					
	1.	Types of eclipses – Solar eclipse – Solar eclipse geometry - Total and annular solar eclipse .	3	K1(R)	Introductory session, Illustration with PPT and videos.	Evaluation through short test, MCQ, True/False, Short essays.
	2.	Lunar eclipse – Umbra – Penumbra - Total and partial lunar eclipse	3	K1(R)	Illustration with PPT and videos.	Evaluation through short test, MCQ, True/False, Short essays.
IV	**INNER PLANETS**					

	1.	Mercury: Planet closest to the sun – Venus: Earth's twin.	3	K4(An)	Introductory session, Illustration with PPT and videos.	Evaluation through short test, MCQ, True/False, Short essays.
	2.	Earth: The water planet – Mars: The red planet	3	K4(An)	Lecture using videos, PPT	Evaluation through short test, MCQ, True/False, Short essays.
V	**OUTER PLANETS**					
	1	Jupiter: The largest planet – Saturn: The ringed planet – Uranus:	3	K2(U)	Lecture using videos, Illustration ,	Evaluation through: quiz, Formative Assessment
	2	Neptune's twin – Neptune: The blue planet – Pluto – Dwarf planet.	3	K2(U)	Illustration , PPT	Evaluation through short test

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

Activities (Em / En /SD): Stellar identification using stellarium mobile app

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

Assignment: Identify the brightest star using stellarium mobile app and analyse its characteristics.

Seminar Topic: (if applicable):-

Sample questions (minimum one question from each unit)

Part A

1. Name the outermost layer of the sun.**(K1-R, CO-1)**
2. What is the gap between the orbit of mars and Jupiter called? **(K2-U, CO-2)**
   a) Asteroids b) Comets c) Meteor d) Meteorite
3. The cross-section of the objects involved in an astronomical eclipse is _____ shaped. **(K3-Ap, CO-3**)
4. Which is the brightest planet in the universe? **(K4-An,CO-4)**
   a) Mercury b) Venus c) Earth d) Saturn

5. Which is the nearest planet to the sun? (**K5-E, CO4)**

a)Neptune b) Mars c) Mercury d)Earth

Part B

1. Write short note on solar flares. **(K1-R, CO-1)**
2. State Bode's law of planetary distances.**(K2-U, CO-2)**
3. Explain the Solar eclipse geometry. **(K3-Ap,CO3)**
4. Compare red and water planet. **(K4-An, CO-4)**
5. Evaluate why Pluto is called dwarf planet. **(K5-E, CO-5)**

Part C

1. With neat sketch, explain the layers present in the sun. (**K1-R, CO-1)**
2. Differentiate Shooting stars from Falling stars.**(K2-U, CO-2)**
3. Calculate the Total and partial lunar eclipse. **(K3-Ap, CO-3)**
4. Analyse the concept "Earth's twin". **(K4-An, CO-4)**
5. Compare the physical properties of largest and ringed planet. **(K5-E, CO-5)**

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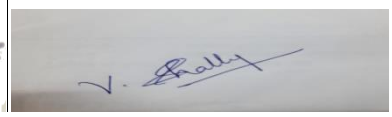


Head of the Department **Course Instructors**

Teaching plan

Department : Physics
Class : II B.Sc. Chemistry
Title of the Course : Elective Course III: Allied Physics for Chemistry– I
Semester : III
Course Code : PU233EC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU233EC1	4	-	-	-	3	4	60	25	75	100

Learning Objectives:

1. To gain a comprehensive understanding of the fundamental principles in Physics.
2. To develop skills for interpreting physical phenomena beneficial for students who have taken programmes other than Physics.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	identify the basic concepts in waves, characteristics of matter, electricity and magnetism, as well as electronics.	**K1**
2.	interpret the principles of ultrasonics and surface tension, and explore their practical applications within the medical domain.	**K2**
3.	articulate real-world solutions leveraging the principles of electricity, magnetism, and electronics within the framework of Digital India.	**K3**
4.	categorize physics principles in everyday situations.	**K4**
5.	prioritize Boolean algebraic concepts in practical scenarios.	**K5**

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

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Properties of Matter**					
	1.	Elasticity: elastic constants – bending of beam – theory of non-uniformbending– determination of Young'smodulus by non-uniform bending	3	K1(R)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	Evaluation through:short testClassTest
	2.	energy stored in a stretched wire – torsionofawire– determination of rigidity modulus by torsional pendulum	3	K2(U)	Peertutoring, Lectureusing videos,Problem solving, Demonstration, PPT, Review	questionsQuiz Formative assessment ShortSummary orOverview
	3.	Viscosity: streamline and turbulentmotion– criticalvelocity coefficient of viscosity	3	K3(Ap)	Lectureusing Chalkandtalk ,Introductory session,Group Discussion, Mind mapping,	
	4.	Surface tension: definition- interfacial surface tension – drop weight method	3	K1(R)	Peertutoring, Lectureusing videos,Problem solving, Demonstration, PPT, Review	
II	**Heat and Thermodynamics**					

	5.	Joule-Kelvineffect – Joule-Thomson porous plug experiment – temperature of inversion –	4	K1(R)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	Evaluation through: short test Class Test Multiplechoice questionsQuiz Formative assessment
	6.	liquefaction of Oxygen - Linde's process of liquefaction of air– liquid Oxygen for medical purpose	4	K2(U)	Peer tutoring, Lecture using videos,Problem solving, Demonstration, PPT, Review	
	7.	laws ofthermodynamics – entropy- heat engine – Carnot's cycle – efficiency	4	K3(Ap)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	
III	**Electricity and Magnetism**					
	8.	Potentiometer– principle – measurement of thermoemf using potentiometer – magnetic field due toacurrent carryingconductor	4	K1(R)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	Evaluation through: short test Class Test Multiplechoice questions Quiz Formative assessment ShortSummary or Overview
	9.	Biot-Savart'slaw– peak, averageandRMS valuesofaccurrent and voltage	4	K1(R)	Peer tutoring, Lecture using videos,Problem solving, Demonstration, PPT, Review	
	10.	power factor and currentvaluesinan AC circuit – types of switches in household and factories	4	K2(U)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	
IV	**Waves, Oscillations and Ultrasonics**					

	11.	Simple harmonic motion (SHM) – compositionoftwo SHMs at right angles (periods in the ratio 1:1) –	4	K1(R)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	Evaluation through: short test Class Test Multiplechoic e questions Quiz Formative assessment Short Summary or Overview
	12.	lawsoftransverse vibrations of strings – determination of AC frequency using sonometer	4	K1(R)	Peer tutoring, Lecture using videos,Problem solving, Demonstration, PPT, Review	
	13.	ultrasound – production – piezoelectric method – application of ultrasonics	4	K2(U)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	
V	**Digital Electronics and Digital India**					
	14.	logic gates, OR, AND, NOT, NAND,NOR, EXOR logic gates	3	K1(R)	Lecture using Chalk and talk, Introductory session,Group Discussion,	Evaluation through:short test Class Test Multiple choice questions Quiz Formative assessment Short Summary or Overview
	15.	Boolean algebra – De Morgan's theorem – verification –	3	K3(Ap)	Peer tutoring, Lecture using videos,Problem solving, Demonstration, PPT, Review	
	16.	overview of Government initiatives: software technological parks under MeitY, NIELIT	3	K2(U)	Lecture using Chalkandtalk ,Introductory session, Group Discussion, Mindmapping,	
	17.	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: Simple Harmonic Motion-Model Making

Seminar Topic: -

Sample questions

PartA

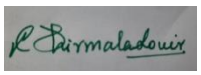
1. The material used in magnetostriction method is_____. **(K1-R,CO-1)**
2. _____is defined as the restoring force per unit area. **(K3-Ap,CO-2)**
3. A_____is a device for measuring potential differences. **(K2-U,CO-3)**
   a) Meter Bridge b) Potentiometer c) Carey Foster Bridge.
4. The maximum value 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

PartB

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 DeMorgan's theorem.**(K3-Ap,CO-5)**



Head of the department

Course Instructors

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