DEPARTMENT OF PHYSICS

HOLY CROSS COLLEGE (Autonomous),Nagercoil-629004

Teaching Plan

Semester: I
Course Name: MECHANICS
Course code: PC2011

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objective: To impart knowledge on basic aspects of dynamics, conservation laws, kinematics, collisions and elasticity.

Course Outcomes

COs	Upon completion of this course, students will be able to	PSO addressed	CL
CO – 1	understand and define the laws involved in mechanics	PSO1	U
CO – 2	apply conservation laws in collision experiments	PSO2	Ap
CO – 3	interpret the principles of gravitation and moment of inertia through theory and experiments	PSO3	Ap
CO – 4	analyze the fundamentals of center of mass and rocket motion	PSO2	An
CO – 5	apply pressure-velocity relation in fluid flow in the field of fluid dynamics	PSO3	Ap

Modules

Credits: 4 Total contact hours: 60 (Including assignments and tests)

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Laws of Motion**					
	1	Laws of conservation of energy, linear momentum and angular momentum – work energy theorem	**2**	To understand the concept of conservation of energy.	Lecture Discussion with PPT illustration	Evaluation through short test Multiple choice questions
	2	work done by gravitational force –	**2**	To be able to derive the	Lecture discussion	
		work done by spring force – potential energy – conservative and non conservative forces – potential energy curve		workdone by gravitational and spring force and distinguish conservative and non conservative forces	with illustration	Formative assessment I
	3	Collision – Elastic and inelastic collision(Fundamental laws of impact) – Newton's law of impact – coefficient of restitution	**3**	To know the principles of collision	Lecture discussion	

	4	Impact of a smooth sphere on a fixed plane – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to impact	**3**	To distinguish between direct impact and oblique impact between two smooth spheres	Lecture discussion	
II	**Dynamics of Rigid Body**					
	1	Moment of inertia – Theorems of perpendicular and parallel axes	**2**	To understand the concept moment of inertia	Lecture Illustration	Short test Quiz Assignment Formative assessment
	2	M.I of a circular ring, disc, solid sphere, hollow sphere and cylinder about all axes	**3**	To categorize moment of inertia of different objects.	Lecture discussion	
	3	Compound pendulum – theory – equivalent simple pendulum – reversibility of centers of oscillation and suspension – determination of g and k	**4**	To be able to find the acceleration due to gravity at a place	Lecture Illustration	
III	**Gravitation**					
	1	Newton's law of gravitation – Kepler's laws of gravitation – G by Boy's method – Mass and density of earth	**2**	To recall the concept of collision and to recognize the impact of smooth spheres.	Lecture with PPT Illustration	Formative assessment II
	2	Acceleration due to gravity – Variation of g with altitude, depth and rotation of earth – Value of g at poles and equator	3	To understand the variation of g with altitude, depth and rotation of earth	Question-answer session Lecture	

	3	Gravitational field – Gravitational potential – Gravitational potential due to spherical shell – Gravitational potential due to a solid sphere (inside and outside)	3	To understand the concept gravitational potential	Lecture with PPT Illustration	
IV	**Central Force Motion**					
	1	Angular velocity, angular momentum and K.E of rotation – Torque and angular acceleration – Relation between them – Expression for acceleration of a body rolling down an inclined plane without slipping	3	To acquire knowledge on angular velocity and angular momentum.	Lecture Discussion	Formative assessment II
	2	Center of mass – Velocity and acceleration of centre of mass – Determination of motion of individual particle – System of variable mass. Rocket motion– Satellite	6	To understand the concept centre of mass	Lecture Discussion	
V	**Statics and Hydrodynamics**					
	1	Friction-laws of friction–Angle of friction– Cone of friction – Centre of gravity – Solid and hollow tetrahedron– solid and hollow hemisphere	3	To have practical knowledge on angle of friction and cone of friction	Lecture with PPT	Short test Formative assessment III

	2	Centre of pressure– vertical rectangular lamina – vertical triangular lamina	3	To understand the concept rectangular and triangular lamina.	Brain storming session. Lecture Illustration	
	3	Hydrodynamics – Equation of continuity– Pitot's tube and Venturimeter – Euler's equation of unidirectional flow – Torricelli's theorem – Bernoulli's theorem and its applications	3	To be able to understand the principles in hydrodynamic s.	Lecture with PPT Illustration	

CO- Course Outcome; CL-Cognitive Level; R- Remember; U- Understand; Ap- Apply; C - Create.

Course Instructors: Dr.LeslyFathima & Sr.Sebastiammal

Semester: I
Course Name: Allied Physics I
Course code: AP2011

No of hours per week	No of credits	Total no of hours	Marks
4	4	60	100

Objectives

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 and basic properties of light such as interference and diffraction.

Course Outcomes

CO	Upon completion of this course the students will be able to:	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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Properties of Matter**					
	1	Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition alone)	2	To understand the basic concepts of Young's modulus and its definition	Illustration and lecture	Evaluation through: quiz, short questions Multiple choice, questions , Deriving theoretical Formulas Problem solving Formative assessment
		Bending of beams – Expression for bending moment	1	To study the Bending of beams and define Expression for bending moment	Illustration and theoretical derivation	
	2	Determination of Young' modulus – uniform and non uniform bending. Expression for Couple per unit twist	2	To determine uniform and non-uniform bending and study couple per unit twist	Illustration, theoretical derivation and Practical	
	3	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	To understand working of torsion pendulum	Lecture and theoretical derivation	
II	**Viscosity**					
	1	Viscosity – Viscous force – Co-efficient of viscosity – Units and dimensions	3	To understand the basic concepts of viscosity and study its units	Illustration, Theoretical formulation Problem Solving	Evaluation through: quiz, short test Assignment on applications. Problem Solving Formative assessment
	2	Poiseuille's formula for co-efficient of viscosity of a liquid – Determination of co- efficient of viscosity using burette and comparison of Viscosities.	3	To determine Poiseuille's formula and determine the co-efficient	Lecture , Theoretical formulation Practical demonstration	
	3	Bernoulli's theorem – Statemen and proof – Venturimeter – Pitot tube.	2	To understand the concept of venturimeter and Pitot tube.	Lecture , Illustration, Theoritical formulation Practical	
III	**Conduction, Convection and Radiation**					
	1	Specific heat capacity of solids and liquids – Dulong and Pettit's law	2	To understand the basic concepts of specific heat capacity	Illustration and lecture	Evaluation through: quiz, short questions

	2	Newton's law of cooling – Specific heat capacity of a liquid by cooling	2	To use the law of Newtons law of cooling to find specific capacity of liquid	Illustration and theoretical derivation	Multiple choice, questions , Deriving theoretical formulas Formative assessment
	3	Thermal conduction –Coefficient of thermal conductivity by Lee's disc method.	1	To understand the basic concepts of conduction mode of heat transfer through experiment	Illustration, theoretical derivation and Demonstration	
	4	Convection process – Lapse rate – Greenhouse effect	1	To define convection mode of heat transfer and study its application	Illustration and lecture	
	5	Black body radiation – Planck's radiation law – Rayleigh Jean's law, Wien's displacement law – Stefan's law of radiation.	2	To deduce laws related to heat transfer through radiation	Illustration, theoretical derivation and Demonstration	
IV	**Thermodynamics**					
	1	Zeroth and First Law of thermodynamics – Second law of thermodynamics	2	To understand the basic concepts of laws of thermodynamics	Lecture, Demonstration, theoretical formulation	Evaluation through: quiz, short questions Multiple choice, questions, Deriving theoretical formulas Formative assessment
	2	Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine	3	To analyse the various aspects of Carnot engine	Lecture, Demonstration, theoretical formulation	
	3	Entropy – 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	To understand the concept of entropy and its applications	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	To understand the basic concepts of interference phenomena and its application	Illustration, Theoretical formulation, Demonstration	Evaluation through: quiz, Deriving theoretical formulas
	2	Diffraction – Difference between diffraction and interference –	2	To understand the basic concepts of	Lecture, Demonstration,	

		Theory of transmission grating – Normal incidence		diffraction phenomena and its application	Theoretical formulation	Assignment on applications
	3	Optical activity – Biot's laws – Specific rotatory power – Determination of specific rotatory power using Laurent's half shadepolarimeter.	3	To understand the basic concepts of optical activity phenomena and its application	Lecture, Demonstration, Theoretical formulation	Formative assessment

CO- Course Outcome; CL-Cognitive Level; R- Remember; U- Understand; Ap- Apply; C - Create.

Course Instructors: Ms.Aji Udahya

Semester I
Non Major Elective Course - I
Course Name: Physics in Everyday Life - I
Course Code: PNM201

No. of hours per week	No of credits	Total no of hours	Marks
2	2	30	100

Objectives

1. To introduce the basic concepts in physics and their applications in everyday life.
2. To understand the physics concept applied in day to day life situations.

Course Outcomes

CO	Upon completion of this course, students will be able to:	PSO's addresed	CL
CO – 1	understand their knowledge of basic scientific principles and fundamental concepts in physics.	PSO1	U
CO – 2	recall the various phenomena of sound waves applied in day today life	PSO2	R
CO – 3	understand the basic laws of physics and different forces involved in nature.	PSO1	Ap
CO – 4	explain the Physics concepts behind sports	PSO3	E
CO – 5	categorize different characteristic nature of light and its properties like refraction, reflection and diffraction.	PSO1	C

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

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Properties of Matter, Heat and Thermodynamics**					
	1	Introduction- Elasticity- Elastic behaviour of materials- Elastic energy- Elastic and Plastic Deformation- Polymers and elastomers- Application of Elastic behaviour of materials	1	To understand the fundamental concepts in elastic behaviour of materials	Lecture, PPT	Quiz, test, Formative assessment (I)
	2	Surface Tension -Concept behind Surface Tension- Examples of surface Tension , Capillary action- Experiment- Examples of capillary action	2	To apply Surface tension effects in day today lie situation.	Lecture, Demonstration	
	3	Viscosity - definition - Applications of Viscosity.	1	To understand the concept viscosity	Lecture	

II	**Sound**					
	1	Introduction- frequency spectrum of Sound waves - The Human voice-How does the ear hears?-	1	To understand the basic properties of sound	Lecture, Demons-tration	Quiz test, Formative assessment
	2	Amazing Abilities of Sound Basic characteristics of sound-	1	To be able to understand the basic characteristics of sound	Lecture,	
	3	Reflection of Sound-echo-Interference -Application of reflection of sound wave	1	To understand the fundamental concept of reflection	Lecture	
	4	Ultra sound: Properties and applications of ultrasound-Applications of sound in human life.	1	To understand the applications of ultrasonic	Lecture, PPT	
III	**Mechanics**					
	1	Introduction- terms used in mechanics- Centripetal and centrifugal forces-	1	To understand Centripetal and centrifugal forces	Lecture	Assignments,

		Contact and non contact forces				
	2	Friction and its types- Newton's laws of motion- gravity	2	To understand friction and its types	Lecture, PPT	Formative assessment
	3	Mass and weight- Mechanics in everyday life.	1	To understand the relation between mass and weight and apply the mechanics in day to day life	Lecture, PPT	
IV	**Biomechanics in Sports**					
	1	Forces and torques in Bio Mechanics- Centre of gravity	1	To understand the forces, normal reaction, friction		Formative assessment
	2	Physics of walking – Physics of cycling – Physics of long jump	1		Lecture, PPT	
	3	Physics of swimming, volleyball and basketball	2	To understand the forces, normal reaction, friction,	Lecture, PPT	
V	**Renewable Energy**					

	1	Solar power – Applications - Wind power and applications - Applications - Hydroelectric power and its uses	2	Understand the natural power	Lecture, PPT	Quiz, Assignments
	2	Biogas plant and its advantages -	1	To use the biogas resources in day	Lecture, PPT	
	3	Advantages and disadvantages of renewable energy sources.	1	To understand the pros and cons of these resources	Lecture, PPT	

CO- Course Outcome; CL-Cognitive Level; R- Remember; U- Understand; Ap- Apply; C - Create.

Course Instructor: S.J.Jenepha Mary

Semester :III

Name of the Course :ELECTRICITY AND MAGNETISM

Subject code :PC1731

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives: 1. To provide knowledge on the basic concept of electric and magnetic fields.

2. To understand the laws and theorems in electromagnetism and their application.

CO	Upon completion of this course the students will be able to :	PSO	CL
CO- 1	Explain the concept and features of the electrostatic force (Coulomb force),magnetic field,flux ,force, the electric force field, Gauss's Law and its application(charged sphere, cylinder, plane sheet)	PSO-1	U
CO- 2	Analyse the presence of electric potential and potential difference, within a framework of distributed symmetric charge distributions	PSO-2	An
CO- 3	Solve problems associated with the effect of uniform magnetic fields on moving charges and current-carrying wires, loops and the magnetic	PSO-3	C
CO -4	Understand the laws of electromagnetic induction as applied to self and mutual induction.	PSO-3	U
CO- 5	Analyse AC circuit behavior (LR,CR and LCR)	PSO-5	An
CO -6	Apply kirchoff's laws and network theorems to electrical circuits .	PSO-2	A
CO-7	Determine magnetic dipole moment using magnetometers and AC bridges, and Ballistic galvanometer to do electrical measurements	PSO-5	E

Credit:4

Unit	Module	Topics	Lecture	Learning	Pedagogy	Assessment/ Evaluation
I	**Electric Field**					
	1	Electric dipole , Force and Torque, Potential energy of a dipole in a uniform electric field	3	To understand the basic concepts and features related to electric field	Illustration and lecture	Evaluation through: quiz, short questions Multiple choice, questions
	2	Lines of force − Flux of the electric field, Gauss law	2	To derive Gauss law in terms of electric field	PPT Illustration Theoretical	
	3	Electric field due to a uniformly charged sphere , infinite cylindrical charge, infinite plane sheet of charge	3	To apply Gauss's Law for different configurations	Illustration Theoretical derivation	
II	**Electrostatic Potential**					
	1	Conservative nature of electrostatic field, Potential difference, Electric potential as line integral of electric	2	To understand the origin of electrostatic field	PPT Illustration,	Evaluation through:

		field		between potential, its line integral and potential	formulation	short test
	2	Potential at a point due to a point charge, uniformly charged conducting sphere, Electric potential energy	3	To extend the idea of potential to calculate potential of different	Lecture , Illustration, Theoritical	Assignment on applications.
	3	Electrical Images - Capacity of a condenser, spherical condenser and Parallel plate condenser	3	To understand the concept of electrical images and evaluate the capacitance of various condensers	Lecture , Illustration, Theoretical formulation	Formative assessment(I &II)
III	**Magnetic field and Electromagnetic induction**					
	1	Magnetic field and Definition of $\vec{B}$, Magnetic force on a particle and Magnetic field lines, Magnetic force on a current carrying wire, Torque on a current loop	3	To understand the basic concepts and features related to Magnetic field $\vec{B}$, the force and torque due	Lecture , Illustration, Theoretical formulation	Evaluation through: quiz, short questions
	2	Faradays law of electromagnetic induction, Lenz law and Explanation of Faradays law	2	To apply laws of electromagnetic induction and be able to calculate self- and mutual inductance.	Lecture , Illustration,	Multiple choice,
	3	Coupling of two coils with flux linkage and Magnetic energy stored in the inductance	3	To evaluate the effect of coupling two inductances and the magnetic energy stored	Illustration, Theoretical formulation	questions , Deriving theoretica
IV	**Electrical Circuits and Network theorems**					
	1	Kirchoff's laws,Series circuit – AC through an L-R circuit, C-R circuit	3	To apply Kirchoff's laws to ac circuit theory including L-R circuit and C-R circuit	Lecture , Demonstration , theoretical	Evaluation through: quiz, short questions
	2	LCR in series resonance circuit- Vector diagram method, The series circuit at resonance, The parallel resonance circuit	3	To analyse the behaviour of series and parallel resonance circuit and arrive at the condition for resonance	Lecture , Demonstration , theoretical formulation	Multiple choice, questions , Deriving theoretical formulae
	3	Network theorems, Ideal constants, Thevenins theorem, Norton's theorem - Maximum power transfer theorem	3	Understand the theorems which decide the distribution of currents and potentials in complex	Lecture , Demonstration , theoretical	Formative assessment (II&III)
V	**Electrical Measurements**					

	1	AC bridges, The Desauty bridge , Anderson's L-C bridge, Owen's L-C bridge	4	To understand the distribution of currents in C-R and L-C , AC	Illustration, Theoretical	Evaluation through: quiz,
	2	Moving coil gavanometer, Correction for damping in Ballistic galvanometers, Measurement of charge sensitivity of a ballistic galvanometer,	4	To understand the theory, working and application of Moving coil gavanometer for	Lecture , Demonstration , theoretical formulation	Deriving theoretical formulas Formative

Course instructor: Dr. Fernando Loretta **Head of the Department:**Dr.S.Mary Delphine

Semester: III

Name of the Course: Non -Conventional energy sources

Subject Code: PC1732

Number of hours per week	No of credits	Total number of hours	Marks
4	4	60	100

Objectives

1. To provide knowledge on various alternative sources of energy.
2. To create awareness about the non-conventional energy sources which will solve the energy crisis.

CO	Upon completion of this course, students will be able to:	PSO	CL
CO-1	Utilize the solar energy for generating the electric power	PSO-6	Ap
CO-2	Apply the solar energy in various sectors (industry, agriculture and domestic purposes)	PSO-4	Ap
CO-3	Explain the basic principles of wind energy conversion, its components and its classification	PSO-1	U
CO-4	Explain the various Biomass conversion Processes	PSO-1	U
CO-5	Elaborate the geothermal energy resources and chemical energy resources (fuel cells)	PSO-2	C
CO-6	Outline the extraction of useful energy from Earth, Ocean, Wind and Sun.	PSO-2	U
CO-7	Design the various pollution-free energy resources(solar heater, solar cooker, Wind mill etc)	PSO-6	C
CO-8	Solve the present and future energy crisis	PSO-7	C

Teaching Plan

Total contact hours: 60 (Including lectures, assignments and Tests)

Unit	Module	Topics	Lecture	Learning outcome	Pedagogy	Assessment
I	**Solar Energy**					
	1	Introduction- Solar water heating - Solar electric power generation- Solar photo voltaics	3	Able to utilize the solar energy for generating power	Lecture discussion	Quiz, Formative Assessment I Multiple Choice Questions
	2	Agriculture and industrial process heat	2	Apply the solar energy in various sectors	Lecture discussion	
	3	Solar distillation – Solar cooker - Solar green houses	3	Design the various Pollution free energy	Lecture with ppt, Group	
	4	Solar production of hydrogen	1	Apply the solar energy for the production	Lecture discussion	
II	**Wind energy**					
	1	Basic principles of wind energy conversion - Nature of the wind- Power in the wind- Site selection	4	Understand the fundamental of wind resource	Lecture , Group discussion	Short Test, Formative Assessment II
	2	Basic components of WECS - Classification of WEC systems - Advantages and disadvantages of WECS -	3	Explain the wind energy, its components	Lecture discussion	
	3	Wind energy collectors - Horizontal axial machines	2	Outline the extraction of wind energy	Lecture discussion	
III	**Bio-Energy**					
	1	Bio mass- Bio conversion technologies- Wet processes- Dry processes-	4	Understand the fundamentals of Biomass conversion processes &	Lecture discussion	Short Test, Formative Assessment I, II
	2	Photosynthesis- Bio gas generation- Factors affecting biodigestion or	2	Explain the Bio gas generation and the	Lecture discussion	

	3	Classification of Bio gas plants - Constructional details of digesters	3	Aware from a technical point of view of Bio gas plants	Lecture, Illustration, Group	
IV	**Geo thermal Energy and Chemical Energy**					
	1	Nature of geo thermal fields – Geo thermal sources - Hydrothermal resources - Vapour dominated systems - Liquid dominated systems Geo pressured	4	Outline the technologies that are used to harness the power of Geo thermal energy	Lecture discussion	Short Test, Formative Assessment II, III
	2	Fuel cells - Design and principle of operation of a fuel cell – Types of fuel cell – Advantages and disadvantages of fuel cells	2	Identify the types of practical fuel cells, their operational principles & basic electrochemistry for understanding the	Lecture discussion	
	3	Conversion efficiency of fuel cells – Types of electrodes – Work output and emf of fuel cells – Applications of fuel cells	3	Explore the methods to calculate fuel cell open circuit voltage, fuel cell loss & efficiency	Lecture discussion	
V	**Energy from the ocean and Hydrogen energy**					
	1	Introduction- Ocean thermal electric conversion(OTEC) - Methods of ocean thermal electric power generation- Open cycle OTEC system- Closed or Anderson OTEC cycle-	3	Understand about the OTEC and the various methods of power generation from ocean energy	Lecture discussion	Short Test, Formative Assessment III
	2	Heat exchangers- Bio fouling- Site selection- Energy utilization-Hybrid cycle- Prospects of ocean thermal energy conversion in India-	4	Explain the ocean energy utilization for various sectors	Lecture discussion	

	3	Hydrogen energy- Hydrogen production- Electrolytic production of hydrogen- Thermo	2	Able to account for the most central principles of Hydrogen production	Group discussion	

Course instructor: M. Abila Jeba Queen **Head of the Department:**Dr.S.Mary Delphine

Semester : II /IV

Name of the Course : Allied Physics II

Subject code : AP1721/AP1741

Teaching Plan

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment /
I	**Thermal Physics**					
	1	Conduction in solids, Thermal conductivity, Lee's disc method- Experiment to determine the thermal conductivity -	2	To understand the basic concepts of conduction mode of heat	Illustration and lecture	Evaluation through: quiz, short questions Multiple choice, questions Deriving theoretical Formulas Problem
		Relation between thermal and electrical conductivities- Widemann – Franz law.	1	To derive the relation betwee electrical conductivity and thermal conductivity	Illustration and theoretical derivation	
	2	Convection: Newton's law of cooling, Determination of specific heat capacity of liquid	2	To define convection mode of heat transfer and study its	Illustration, theoretical derivation	
	3	Radiation: Distribution of energy in the spectrum of black body – Results.	3	To understand radiation mode of heat transfer and black body radiation	Lecture and theoretical derivation	
II	**Current Electricity**					
	1	Ohms law- Electrical conductivity - Kirchoff's law - Wheatstone's bridge – condition for balance	3	To understan the basi d and features related to Current Electricity	Illustration, Theoritical formulation	Evaluation through: quiz, short test Assignment on applications.
	2	Carey Foster's Bridge – Measurement of specific resistance – Determination of temperature coefficient of resistance	3	To determine temperature coefficient of resistance	Lecture , Theoretical formulation Practical	

	3	Potentiometer - calibration of voltmeter and ammeter.	2	To understand the concept of calibrating voltmeter and ammeter using potentiometer	Lecture , Illustration, Theoretical formulatio n Practical	Problem Solving Formative
III	**Electromagnetism**					
	1	Electromagnetic Induction – Faraday's laws – Lenz's law	3	To understan the basi d and features related to	Lecture , Illustration ,	Evaluatio n through:

				Electromagnetism	formulation	questions
	2	Self-inductance − mutual inductance − Experimental determination of mutual inductance- Coefficient of coupling	2	To apply laws of electromagnetic induction and be able to calculate self- and mutual	Lecture , Illustration ,	Multiple choice, questions ,
	3	Alternating current − Mean, RMS, peak - A.C. Circuits − LCR in series.	3	To understand the basi concepts of alternating current	Illustration, Theoretical formulatio n Practical	Deriving theoretica l formulas
IV	**Semi conductor Electronics**					
	1	Semiconductor − pn junction s diode	2	To understan the basi d and features related to Semiconductor	Lecture , Demonstration , theoretical	Evaluatio n through: quiz, short questions
	2	Half wave and full wave rectifier − Bridge rectifier	2	To analyse the different type of rectifiers	Lecture , Demonstration ,	
	3	Zener diode - Regulated power supply	2	To understand the concept of using zener diode as voltage regulator	Lecture , Demonstration , theoretical	Multiple choice, questions ,
		Transistor − CE Configuration	2	To understan the basi d and features related to	Lecture , Demonstration , theoretical	Deriving theoretica l
V	**Digital Electronics**					
	1	Number systems- decimal − binary − Conversion of Decimal Number into Binary Number- binary addition, subtraction, multiplication and division	4	To understand the basic concepts and features related to binary and decimal number	Illustration, Theoretical formulatio n	Evaluatio n through: quiz,
	2	Logic gates − OR, AND, NOT, XOR, NAND and NOR gates − truth tables − NAND and NOR as Universal gates	4	To get thorough knowledge on logic gates	Lecture , Demonstration , theoretical formulation	Deriving theoretical Formulas Assignment on

						assessment

Course instructor: Dr. R. Krishna Priya, Ms. M. Abila Jeba Queen, Ms. P.Aji Udhaya

Head of the Department: Dr.S.Mary Delphine

Semester: IV
Name of the Course : ANALOG SYSTEM AND APPLICATIONS
Subject code : PC1741
Teaching Plan

Unit	Modules	Topics	Lecture	Learning outcome	Pedagogy	Assessment /Evaluation
I	**Semiconductor diodes and transistors**					
	1	Semiconductor materials – Intrinsic semiconductors – Extrinsic semiconductors, N-type semiconductor – P-type semiconductor	2	Identify the different types of semiconductor materials	Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers
	2	P-N Junction , P-N Junction without external voltage, P-N junction with forward bias and reverse bias, V-I characteristics of a P-N junction diode – Static and	3	Understand the structure and functioning of a P-N junction diode under	Descriptive lecture. Practical demonstration	Evaluation through: quiz, short questions Descriptive answers Formative assessment
	3	Half wave rectifier , Bridge Rectifier, Calculation of ripple factor and rectification efficiency , Filters (π filter), Zener diode , Voltage regulator	3	Understand the working of rectifiers, filters and voltage regulators	PPT Illustration, Descriptive lecture. Practical	
	4	Junction transistor-structure, working, transistor, Amplifying action – Three configurations, Transistor characteristics (CE configuration	3	Understand the structure ,working and amplification action of a	Descriptive lecture. Practical demonstration	
II	**Transistor amplifier**					

	1	Transistor biasing, selection of operating point, Bias stabilization ,Fixed bias and Voltage divider bias	3	Understand the concept of biasing and the different types of biasing	Descriptive lecture.	Evaluation through: quiz,
	2	Single stage transistor amplifier, Development of transistor AC equivalent circuit method, h-parameter equivalent circuit	3	Analyse single stage transistor using AC equivalent circuit and h	Descriptive lecture. Practical demonstration	Problem solving short questions
	3	Analysis of a single state CE amplifier using hybrid models , Input and output impedance, current-voltage and power gain	3	Analyse the working of a single stage transistor and arrive at relation for various	Descriptive lecture. Theoretical formulation	Descriptive answers Assignment Formative
III	**Feedback in Amplifiers**					
	1	Concept of feedback in amplifiers, Types of feedback, Voltage gain of amplifier	3	Understand the concept and types of feedback	PPT Illustration , Descriptive lecture.	Evaluation through: quiz,
	2	Effect of negative feedback on gain stability, distortion and noise,input and output impedence	4	Explain the advantages of negative	Descriptive lecture. Theoretical	short questions
	3	Amplifier circuits with negative feedback, RC coupled amplifier without bypass capacitor, Emitter follower	3	Apply the concept of feedback in different practical circuits	Descriptive lecture. Theoretical formulation , Practical demonstrat	Descriptive answers Formative
IV	**Oscillator**					
	1	Need for an oscillator, Generating sine wave using tuned oscillator circuit, Frequency of oscillations in LC circuit	3	Understand the principle and working of oscillators	Descriptive lecture, Theoretical formulation	Evaluation through: quiz,
	2	Positive feedback in amplifier (Barkhausen criterion), Starting voltage , LC oscillators, Hartley and	4	Explain about the internal circuitry and working of various types of	Theoretical formulation , Practical demonstrat	short questions

				oscillators		answers
	3	Basic principle of RC oscillators – RC phase shift oscillator, Wien bridge oscillator,crystal oscillator	4	Identify the different construction and circuit design of oscillators	Descriptive lecture. Theoritical formulation ,	Assignment Formative assessment
V	**Operational amplifier**					
	1	Parameters of a general and Ideal operational amplifier	3	Understand the basic parameters,operations and features of	Descriptive lecture. Theoretical formulation	Evaluation through: quiz, short questions Descriptive answers Formative assessment
	2	Inverting and Non-inverting amplifier, Difference and Summing amplifier, Log and antilog amplifiers,	4	Identify the use of Opamp in various circuits	Descriptive lecture. Theoretical formulation ,	
	3	Opamp as Voltage follower, Integrator, Differentiator, Comparators and Schmitt trigger	4	Apply the Opamp for different applications	Descriptive lecture. Theoretical formulation ,	

Course instructor: Dr. V. Shally **Head of the Department:** Dr. S. Mary Delphine

Semester : V

Name of the Course : Elements of Modern Physics Subject code : PC1751

No of hours per week	No. of credits	Total No. of hours	Marks
6	5	90	100

Objectives: 1. To provide insight into wave- particle duality and its consequence.
2.To apply skill related to principle and concepts of modern physics.

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	Explain the theories and experiment related to particle and wave nature of light.	PSO-1	U
CO- 2	Identify particle nature experiments (photoelectric effect, planks law, Compton effect, photoelectric effect) and wave nature experiments(Thomson experiment, Davision Germer experiment).	PSO-2	Ap
CO- 3	Define uncertainty principle.	PSO-2	R
CO -4	Analyse various models of atomic spectra.	PSO-5	An
CO- 5	Solve Schrodinger equation in different dimensional stages.	PSO-4	C
CO- 6	Estimate Lorentz transformation for length contraction ,time dilation.	PSO-5	E

Unit	Module	Description	Lecture hours	Learning outcome	Pagagogy	Assessment /Evaluation
I	**Particle Nature of Radiation**					

	1	Introduction , Spectral distribution of blackbody radiation, Quantum hypothesis of Planck	2	To summarise the quantum theories	PPT, Lecture method	Quiz test, Formative assessment (I)
	2.	Planck's law of radiation, Photoelectric Effect, Photoemission characteristics Failure of electromagnetic wave theory, Einstein's	5	To explain particle nature	PPT,	

		Photoelectric equation		theories		
	3.	Millikan's verification of Einstein's equation, Continuous X-ray Spectrum, Compton effect	4	To explain particle nature experiments	Lecture	
	4.	Energy of scattered radiation and recoil electron, Compton scattering vs Photoelectric effect,Pair Production, Particle or Waves.	4	To compare Compton and Photoelectric effect	PPT, Lecture, Group discussion	
II	**Wave Nature of Particles**					
	1	Introduction , De Broglie waves and wavelength, Wavelength vs Voltage	3	To explain wave nature theories	PPT,	Quiz test, Formative assessment (I), Assignment
	2.	Davisson –Germer experiment, Experiments of G.P Thomson, Frisch and stern's method	4	To explain wave nature experiments	Lecture method	
	3.	Standing electron waves in a circular orbit, Heisenberg's uncertainty principle	4	To Define uncertainty principle	PPT, Lecture, Group discussion	
	4.	Uncertainty relation, Uncertainty principle and concept of Bohr orbits, Derivation of the uncertainty principle, Phase velocity and group velocity, Phase and group velocities of matter waves.	4	To Derive uncertainty relation	PPT, Lecture, Group discussion	
III	**Atomic spectra**					
	1	Introduction ,Spectra of H atom,Orbital magnetic moment of H atom, Larmor precession	3	To analyse various models of atomic spectra	Lecture, Group discussion	Quiz test, Formative assessment (II),

	2	Stern Gerlach experiment,Electron Spin,Vector atom model,Spin-orbit interaction	4	To analyse various interaction	PPT, Lecture,	
	3.	Pauli's exclusion principle,Total angular momentum in multi-electron atoms,Energy levels and transitions of helium,Alkali spectra	5	To analyse various models of spectra	PPT, Lecture, Group discussion	
	4.	Normal Zeeman effect,Anomalous Zeeman effect, Stark effect	3	To differentiate differet effects	PPT, Lecture,	
IV	**Atomic models and Quantum Mechanics**					
	1	Introduction ,Atomic spectra,Thomson's model Rutherford's nuclear atom model	2	To analyse various models of atomic spectra	PPT, Lecture,	Quiz test, Formative assessment (II & III),
	2	Bohr's model of hydrogen atom Hydrogen spectrum Ritz combination principle Correction for finite nuclear mass	4	To explain hydrogen atom model	PPT, Lecture,	
	3	Discovery of heavy hydrogen , Hydrogenic atoms Sommerfeld's model , Bohr's correspondence principle,Resonance, excitation and ionization potentials,– Measurements of critical potentials Merits and Limitations of Bohr's theory	4	To explaint the Merits and Limitations of Bohr's theory	PPT, Lecture,	
	4	Schrodinger wave equation , Schrodinger time dependent wave equation Schrodinger time independent wave equation, Physical significance of the wave function	3	To Solve Schrodinger equation	PPT, Lecture,	

	5	Applications of Schrodinger wave equation , Particle in a one dimensional potential well Particle in three dimensional box, Degeneracy Electrons in a metal.	2	To Solve Schrodinger equation in different dimensional stages.	PPT, Lecture,	
V	**Special Theory of Relativity**					
	1	Introduction ,Frame of reference, Galilean transformations,Michelson-Morley experiment	2	To explain differed reference	Lecture, PPT	Formative assessment (II & III),
	2	Einstein's postulates,Lorentz transformations Length contraction,Time dilation	3	Estimate Lorentz transformation for length contraction, time dilation.	Lecture.	
	3	Relativity of simultaneity,Addition of relativistic velocities, Relativistic mass,Mass-energy relation	4	Estimate Lorentz transformation for	Lecture, PPT	
	4	Minkowski's four dimensional space,Time continuum,General theory of relativity,Massless particle.	6	Derive four dimensional space,Time continuum	Lecture	

Course Instructor : Dr. V. Shally and Dr. R. Krishna Priya

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Waves and Optics

Subject code : PC1752

No of hours per week	No. of credits	Total No. of hours	Marks
6	5	90	100

Objectives 1. To study the electromagnetic nature of light.

2.To enable the students to link the theory with day to day life.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	explain the fundamental principle of optics.	PSO - 1	U
CO - 2	determine the behavior of a ray at any optical surface .(lenses, Prisms).	PSO - 6	E
CO - 3	explain the types of waves and its characteristics.	PSO - 2	U
CO - 4	analyze the intensity variation of light due to polarization, interference and diffraction.	PSO - 3	An
CO - 5	distinguish Interference, diffraction and polarization.	PSO - 2	An
CO - 6	test the optical planeness of any optical surface.	PSO - 6	C
CO - 7	measure the various optical parameters. (focal length, power, refractive index, radius of curvature, dispersive power etc) using optical components (prism, lenses, glass plate, grating).	PSO - 4	E
CO - 8	understand the interference and diffraction from wave optics concepts and know its applications. Understand polarization of light and its applications.	PSO - 1	U

Unit	Module	Description	Lecture hours	Learning outcome	Pagagogy	Assessment/ Evaluation
I	**Geometrical Optics**					
	1	Introduction – Refractive index and optical path- Sign convention – Refraction through lenses – Principal foci	2	To summarise the basic concepts of optics	PPT, Lecture method	Quiz test, Formative assessment (I)
	2.	Deviation produced by a thin lens – Power	5	To	Lecture,	

		of a lens - Aberrations – Spherical aberration in a lens –Methods of reducing spherical aberration (brief) – Chromatic aberration		explain the various aberrations in lens systems	PPT	
	3.	Dispersion by a prism - Refraction through a prism – Angular and chromatic dispersion – Dispersive power	4	To discuss the dispersion and refraction in a prism	Lecture	
	4.	Achromatism in prism – Dispersion without deviation – Condition for achromatism of two lenses placed in contact and separated by a finite distance.	4	To explain achromatic principles of prism	PPT, Lecture, Group discussion	
II	**Wave Optics**					
	1	Oscillations – Waves – Travelling waves – Wave front and ray – Examples of waves – Characteristics	3	To explain the different types of waves and characteristics	PPT,	Quiz test, Formative assessment (I), Assignment
	2.	Mathematical representation – Phase velocity – Complex representation – Wave packet and band width – Group velocity	4	To explain the phase velocity and group velocity of waves.	Lecture method	
	3.	Propagation of light waves: Introduction – Maxwell's equations – Physical significance	4	To discuss the light propagation in a medium	PPT, Lecture, Group discussion	
	4.	Electromagnetic waves – Constitutive	4	To	PPT,	

		relations – Wave equation for free space – Velocity of Electromagnetic waves – Relation between refractive index and relative permittivity.		explain the various parameters of waves	Lecture, Group discussion	
III	**Interference**					
	1	Introduction – Young's experiment – Coherent source – Phase and path difference	3	To analyse the principle in interference	Lecture, Group discussion	Quiz test, Formative assessment (II),
	2	Analytical treatment – Theory of interference – Fresnel's biprism – Fringes with white light	4	To explain the differed theories of interference	PPT, Lecture,	
	3.	Lioyd's mirror – Interference in thin films – Interference due to reflected and transmitted light	5	To explain the interference in thinfilms	PPT, Lecture, Group discussion	
	4.	Wedge shaped thin film – Testing the planeness – Newton's rings – Determination of λ	3	To determine the wavelength of the light source	PPT, Lecture,	
IV	**Diffraction**					
	1	Fraunhofer diffraction : Introduction – Single slit – Intensity distribution	2	To analyse the principle in	PPT, Lecture,	Quiz test, Formative assessment (II & III),

				diffraction		
	2	Double slit – Comparison between interference and diffraction – Fraunhofer diffraction at N slits	4	To compare the interference and diffraction	PPT, Lecture,	
	3	Plane diffraction grating – Theory – Principal maxima – Oblique incidence	4	To explain the theoritical principles in diffraction grating	PPT, Lecture,	
	4	Determination of λ using grating – Dispersive power – Fresnel's diffraction	3	To determine the dispersive power	PPT, Lecture,	
	5	Introduction – Huygen's Fresnel theory – Fresnel's assumptions – Rectilinear propagation of light	2	To explain the theoritical principles of diffraction	PPT, Lecture,	
V	**Polarization**					
	1	Introduction – Polarization – Unpolarized and polarized light – Types of polarization	2	To explain the polarization of light	Lecture, PPT	Formative assessment (II & III),

	2	Production of plane polarized light – Polarizer and analyser – Anisotropic crystals – Double refraction	3	To explain the polarization and double refraction in crystals	Lecture.	
	3	Ordinary and extra ordinary ray – Positive and negative crystals – Nicol prism – Quarter and half wave plates	4	To discuss the half and quarter wave plates	Lecture, PPT	
	4	Production and analysis of elliptically and circularly polarized light – Analysis of polarized light	6	To analyze the different polarized lights	Lecture	

Course Instructor : Dr. S. Mary Delphine and Dr. Abila Jeba Queen

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Solid State Physics

Subject code : PC1753

No of hours per week	No of credits	Total no of hours	Marks
6	5	90	100

Objectives

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

CO	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

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment /Evaluation
I	**Bonding in Solids**					
	1	Bonding in solids, An over view of an atom, Condition for bonding, Octet rule and stability	**4**	To acquire knowledge on bonding in solids	Lecture Discussion with PPT illustration	Evaluation through short test Multiple choice questions Formative assessment I
	2	Van der Waal's bonding, Ionic bonding, Covalent bonding	**3**	To understand the different kinds of bonding	Lecture discussion with PPT illustration	
	3	Dipole-dipole interactions, Hydrogen bonding, Metallic bonding, Mixed bonding	**4**	To acquire knowledge on hydrogen, metallic and mixed bonding	Lecture discussion	

	4	Calculation of ionization energies for compounds, Comparison of physical properties	**4**	To be able to determine the ionization energies	Lecture discussion	
II	**Crystalline Materials**					
	1	Classification of solids, Periodicity in crystalline solids, Lattice translation vectors	**4**	To understand the concept of crystal structure.	Lecture Illustration	Short test Quiz Assignment Formative assessment I
	2	Unit and primitive cells, Bravais lattices, Symmetry operations	**4**	To acquire knowledge on unit cells and bravais lattices	Lecture discussion	
	3	Crystal indexing, Miller indices of lattice planes, Directions in crystals, Atomic packing factor (APF)	**4**	To be able to determine the miller indices of lattice planes	Lecture discussion	
	4	Density and lattice constant, Other common crystal structures	**3**	To acquire knowledge on other crystal structures	Lecture Illustration	
III	**Magnetic Materials**					
	1	Magnetic and nonmagnetic materials, Magnetic dipole compared with electric dipole	**3**	To be able to distinguish between magnetic and nonmagnetic materials	Lecture with PPT Illustration	Short test Quiz Formative assessment II
	2	Important terms in magnetism, Sources of permanent magnetic moment	3	To know the important terms in magnetism	Lecture with PPT Illustration	
	3	Classification of magnetic materials, Theory of diamagnetism, Classical theory of para magnetism, Theories of ferromagnetism, The Weiss exchange (molecular) field	5	To know the classical theory involved in Dia and Para magnetism	Lecture with PPT Illustration	
	4	Domain theory, Hysteresis, Hard and soft	4	To acquire knowledge	Question-answer	

		magnetic material, Antiferromagnetism Ferrimagnetism		on ferro, ferri and antiferro magnetism	session Lecture	
IV	**Dielectric Materials**					
	1	Dielectrics, Polarizability and dielectric constant, Types of polarization	4	To acquire knowledge on Dielectrics, Polarizability and dielectric constant	Lecture Discussion	Formative assessment II
	2	Langevin's theory of polarization in polar dielectrics, Piezoelectric materials, Ferroelectrics, Antiferroelectricity	3	To acquire knowledge on piezoelectric and ferroelectric materials	Lecture Discussion	
	3	Internal or local field, Clausius Mossotti equation, Lorentz-formula, Frequency and temperature effects on polarization	4	To be able to understand the effects of Frequency and temperature on polarization	Lecture Discussion	
	4	Dielectric breakdown, Dielectric loss, Classification of insulating materials, Important insulating materials	4	To be able to classify the insulating materials	Brain storming session. Lecture Discussion	
V	**Semiconductors and Superconductors**					
	1	Bands in solids , Elemental and compound semiconductors, Conduction in semiconductors, Band structure of semiconductors	4	To acquire knowledge on elemental and compound semiconductors	Lecture with PPT	Short test Formative assessment III
	2	Concentration of charge carriers, Mobility and conductivity in semiconductors	3	To understand the concept of mobility and conductivity	Lecture Illustration	
	3	Discovery of superconductivity, Superconductivity and	4	To understand the properties of superconductors	Lecture with PPT	

		magnetism, Critical magnetic field, Meissner effect, Magnetic induction in superconductors			Illustration	
	4	Type I and Type II Superconductors, Isotope effect, Applications of superconductors	4	To understand the significance and applications of superconductors	Lecture with PPT	

Course Instructor : Dr. C. Nirmala Louis

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Programming with C++

Subject code : PC1754

Number of hours per week	No of credits	Total number of hours	Marks
5	4	75	100

Objectives:

1. To apply C++ language to write simple programs for solving general Physics problems
2. To enable the students developing their own Applications using C++ and evolve as efficient software programmers

CO	Upon completion of this course, students will be able to:	PSO	CL
CO - 1	describe the principles of object oriented program. (abstraction, encapsulation, inheritance and polymorphism)	PSO - 4	C
CO - 2	apply object oriented programming techniques to solve computing problems.	PSO - 4	Ap
CO - 3	develop programs using functions and classes. (objects, array of objects, friend functions, passing and returning objects)	PSO - 4	C
CO - 4	develop programs using constructor, destructor, operator overloading and inheritance.	PSO - 4	C
CO - 5	formulate the applications of pointers and virtual functions.	PSO - 4	C

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Principles of object oriented Programming**					
	1	Object-oriented programming, paradigm, Basic concepts of object oriented pro gramming	3	To understand the basic concepts of object oriented pro gramming	Lecture Discussion with PPT illustration	Evaluation through short test Multiple choice questions Formative assessment I
	2	Benefits of OOP, Object-oriented languages, Applications of OOP	3	To know the benefits and applications of OOP	Lecture discussion with PPT illustration	
	3	Introduction to C++ and its applications, A simple C++ program – An example with class	3	To be able to write a simple program in C++	Lecture discussion	
	4	Structure of C++ program, Creating the source file, Compiling and Linking	3	To be able to understand the structure of C++ program	Lecture discussion	
II	**Tokens, Expressions and Control Structures**					
	1	Introduction, Tokens, Keywords, Identifiers and constants	3	To understand the concept of Tokens, Keywords, Identifiers and constants	Lecture Illustration	Short test Quiz Assignment Formative assessment I
	2	Basic data types, User defined data types, Storage classes, Derived data types, Symbolic constants	3	To acquire knowledge on basic and user defined data types	Lecture discussion	
	3	Declaration of Variables, Dynamic initialization of variables, Reference variables	3	To understand the concept dynamic initialization of variables	Lecture discussion	
	4	Operators in C++, Scope resolution	3	To acquire knowledge on	Lecture	

		operator, Memory management operator		operators	Illustration	
III	**Functions, Classes and Objects**					
	1	The main function, Function prototyping, Call by reference, Return by reference	3	To acquire knowledge on main function and function prototyping	Lecture with PPT Illustration	Short test Quiz Formative assessment II
	2	Inline functions, Default arguments, Constant arguments, Function overloading, Friend and virtual functions	3	To be able to understand the concept functions	Lecture with PPT Illustration	
	3	Specifying a class, Defining member function, A C++ program with class, Making an outside function inline, Nesting of member functions	3	To be able to specify a class	Lecture with PPT Illustration	
	4	Private member functions, Arrays within a class, Memory allocation for objects, Static data members, Static member functions, Arrays of objects, Friendly functions	3	To acquire knowledge on arrays within a class and arrays of objects	Question-answer session Lecture	
IV	**Constructors, Destructors and Operator overloading**					
	1	Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects	3	To understand the concept constructors	Lecture Discussion	Formative assessment II

	2	Copy constructor, Dynamic constructors, Constructing two dimensional arrays, Destructors	3	To acquire knowledge on copy constructor and dynamic constructors	Lecture Discussion	
	3	Defining Operator overloading, Overloading Unary operators, overloading, Binary operators, Overloading Binary operators using friends	3	To be able to understand overloading operators	Lecture Discussion	
	4	Manipulation of strings using operators, Rules for overloading operators	3	To understand the rules for Overloading operators	Brain storming session. Lecture Discussion	
V	**Inheritance, Pointers and Virtual functions**					
	1	Defining derived classes, Single inheritance, Making a private member inheritable	3	To acquire knowledge on inheritance	Lecture with PPT	Short test Formative assessment III
	2	Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.	3	To be able to distinguish between multilevel inheritance and multiple inheritance	Lecture Illustration	
	3	Pointers, Pointers to objects, Pointers to derived classes	3	To acquire knowledge on pointers	Lecture with PPT Illustration	
	4	Virtual functions, Virtual constructors and destructors.	3	To understand the significance of virtual functions	Lecture with PPT	

Course Instructor : Dr. M. Priyadharshini and Dr. A. Lesly Fathima

Head of the Department : Dr. S. Mary Delphine

Semester : V

Name of the Course : Elements of Modern Physics Subject code : PC1751

No of hours per week	No. of credits	Total No. of hours	Marks
6	5	90	100

Objectives: 1. To provide insight into wave- particle duality and its consequence.
2.To apply skill related to principle and concepts of modern physics.

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	Explain the theories and experiment related to particle and wave nature of light.	PSO-1	U
CO- 2	Identify particle nature experiments (photoelectric effect, planks law, Compton effect, photoelectric effect) and wave nature experiments(Thomson experiment, Davision Germer experiment).	PSO-2	Ap
CO- 3	Define uncertainty principle.	PSO-2	R
CO -4	Analyse various models of atomic spectra.	PSO-5	An
CO- 5	Solve Schrodinger equation in different dimensional stages.	PSO-4	C
CO- 6	Estimate Lorentz transformation for length contraction ,time dilation.	PSO-5	E

Unit	Module	Description	Lecture hours	Learning outcome	Pagagogy	Assessment /Evaluation
I	**Particle Nature of Radiation**					

	1	Introduction , Spectral distribution of blackbody radiation, Quantum hypothesis of Planck	2	To summarise the quantum theories	PPT, Lecture method	Quiz test, Formative assessment (I)
	2.	Planck's law of radiation, Photoelectric Effect, Photoemission characteristics Failure of electromagnetic wave theory, Einstein's	5	To explain particle nature	PPT,	

		Photoelectric equation		theories		
	3.	Millikan's verification of Einstein's equation, Continuous X-ray Spectrum, Compton effect	4	To explain particle nature experiments	Lecture	
	4.	Energy of scattered radiation and recoil electron, Compton scattering vs Photoelectric effect,Pair Production, Particle or Waves.	4	To compare Compton and Photoelectric effect	PPT, Lecture, Group discussion	
II	**Wave Nature of Particles**					
	1	Introduction , De Broglie waves and wavelength, Wavelength vs Voltage	3	To explain wave nature theories	PPT,	Quiz test, Formative assessment (I), Assignment
	2.	Davisson –Germer experiment, Experiments of G.P Thomson, Frisch and stern's method	4	To explain wave nature experiments	Lecture method	
	3.	Standing electron waves in a circular orbit, Heisenberg's uncertainty principle	4	To Define uncertainty principle	PPT, Lecture, Group discussion	
	4.	Uncertainty relation, Uncertainty principle and concept of Bohr orbits, Derivation of the uncertainty principle, Phase velocity and group velocity, Phase and group velocities of matter waves.	4	To Derive uncertainty relation	PPT, Lecture, Group discussion	
III	**Atomic spectra**					
	1	Introduction ,Spectra of H atom,Orbital magnetic moment of H atom, Larmor precession	3	To analyse various models of atomic spectra	Lecture, Group discussion	Quiz test, Formative assessment (II),

	2	Stern Gerlach experiment,Electron Spin,Vector atom model,Spin-orbit interaction	4	To analyse various interaction	PPT, Lecture,	
	3.	Pauli's exclusion principle,Total angular momentum in multi-electron atoms,Energy levels and transitions of helium,Alkali spectra	5	To analyse various models of spectra	PPT, Lecture, Group discussion	
	4.	Normal Zeeman effect,Anomalous Zeeman effect, Stark effect	3	To differentiate differet effects	PPT, Lecture,	
IV	**Atomic models and Quantum Mechanics**					
	1	Introduction ,Atomic spectra,Thomson's model Rutherford's nuclear atom model	2	To analyse various models of atomic spectra	PPT, Lecture,	Quiz test, Formative assessment (II & III),
	2	Bohr's model of hydrogen atom Hydrogen spectrum Ritz combination principle Correction for finite nuclear mass	4	To explain hydrogen atom model	PPT, Lecture,	
	3	Discovery of heavy hydrogen , Hydrogenic atoms Sommerfeld's model , Bohr's correspondence principle,Resonance, excitation and ionization potentials,– Measurements of critical potentials Merits and Limitations of Bohr's theory	4	To explaint the Merits and Limitations of Bohr's theory	PPT, Lecture,	
	4	Schrodinger wave equation , Schrodinger time dependent wave equation Schrodinger time independent wave equation, Physical significance of the wave function	3	To Solve Schrodinger equation	PPT, Lecture,	

	5	Applications of Schrodinger wave equation , Particle in a one dimensional potential well Particle in three dimensional box, Degeneracy Electrons in a metal.	2	To Solve Schrodinger equation in different dimensional stages.	PPT, Lecture,	
V	**Special Theory of Relativity**					
	1	Introduction ,Frame of reference, Galilean transformations,Michelson-Morley experiment	2	To explain differed reference	Lecture, PPT	Formative assessment (II & III),
	2	Einstein's postulates,Lorentz transformations Length contraction,Time dilation	3	Estimate Lorentz transformation for length contraction, time dilation.	Lecture.	
	3	Relativity of simultaneity,Addition of relativistic velocities, Relativistic mass,Mass-energy relation	4	Estimate Lorentz transformation for	Lecture, PPT	
	4	Minkowski's four dimensional space,Time continuum,General theory of relativity,Massless particle.	6	Derive four dimensional space,Time continuum	Lecture	

Course Instructor : Dr. V. Shally and Dr. R. Krishna Priya

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Waves and Optics

Subject code : PC1752

No of hours per week	No. of credits	Total No. of hours	Marks
6	5	90	100

Objectives 1. To study the electromagnetic nature of light.

2.To enable the students to link the theory with day to day life.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	explain the fundamental principle of optics.	PSO - 1	U
CO - 2	determine the behavior of a ray at any optical surface .(lenses, Prisms).	PSO - 6	E
CO - 3	explain the types of waves and its characteristics.	PSO - 2	U
CO - 4	analyze the intensity variation of light due to polarization, interference and diffraction.	PSO - 3	An
CO - 5	distinguish Interference, diffraction and polarization.	PSO - 2	An
CO - 6	test the optical planeness of any optical surface.	PSO - 6	C
CO - 7	measure the various optical parameters. (focal length, power, refractive index, radius of curvature, dispersive power etc) using optical components (prism, lenses, glass plate, grating).	PSO - 4	E
CO - 8	understand the interference and diffraction from wave optics concepts and know its applications. Understand polarization of light and its applications.	PSO - 1	U

Unit	Module	Description	Lecture hours	Learning outcome	Pagagogy	Assessment/ Evaluation
I	**Geometrical Optics**					
	1	Introduction – Refractive index and optical path- Sign convention – Refraction through lenses – Principal foci	2	To summarise the basic concepts of optics	PPT, Lecture method	Quiz test, Formative assessment (I)
	2.	Deviation produced by a thin lens – Power	5	To	Lecture,	

		of a lens - Aberrations – Spherical aberration in a lens –Methods of reducing spherical aberration (brief) – Chromatic aberration		explain the various aberrations in lens systems	PPT	
	3.	Dispersion by a prism - Refraction through a prism – Angular and chromatic dispersion – Dispersive power	4	To discuss the dispersion and refraction in a prism	Lecture	
	4.	Achromatism in prism – Dispersion without deviation – Condition for achromatism of two lenses placed in contact and separated by a finite distance.	4	To explain achromatic principles of prism	PPT, Lecture, Group discussion	
II	**Wave Optics**					
	1	Oscillations – Waves – Travelling waves – Wave front and ray – Examples of waves – Characteristics	3	To explain the different types of waves and characteristics	PPT,	Quiz test, Formative assessment (I), Assignment
	2.	Mathematical representation – Phase velocity – Complex representation – Wave packet and band width – Group velocity	4	To explain the phase velocity and group velocity of waves.	Lecture method	
	3.	Propagation of light waves: Introduction – Maxwell's equations – Physical significance	4	To discuss the light propagation in a medium	PPT, Lecture, Group discussion	
	4.	Electromagnetic waves – Constitutive	4	To	PPT,	

		relations – Wave equation for free space – Velocity of Electromagnetic waves – Relation between refractive index and relative permittivity.		explain the various parameters of waves	Lecture, Group discussion	
III	**Interference**					
	1	Introduction – Young's experiment – Coherent source – Phase and path difference	3	To analyse the principle in interference	Lecture, Group discussion	Quiz test, Formative assessment (II),
	2	Analytical treatment – Theory of interference – Fresnel's biprism – Fringes with white light	4	To explain the differed theories of interference	PPT, Lecture,	
	3.	Lioyd's mirror – Interference in thin films – Interference due to reflected and transmitted light	5	To explain the interference in thinfilms	PPT, Lecture, Group discussion	
	4.	Wedge shaped thin film – Testing the planeness – Newton's rings – Determination of λ	3	To determine the wavelength of the light source	PPT, Lecture,	
IV	**Diffraction**					
	1	Fraunhofer diffraction : Introduction – Single slit – Intensity distribution	2	To analyse the principle in	PPT, Lecture,	Quiz test, Formative assessment (II & III),

				diffraction		
	2	Double slit – Comparison between interference and diffraction – Fraunhofer diffraction at N slits	4	To compare the interference and diffraction	PPT, Lecture,	
	3	Plane diffraction grating – Theory – Principal maxima – Oblique incidence	4	To explain the theoritical principles in diffraction grating	PPT, Lecture,	
	4	Determination of λ using grating – Dispersive power – Fresnel's diffraction	3	To determine the dispersive power	PPT, Lecture,	
	5	Introduction – Huygen's Fresnel theory – Fresnel's assumptions – Rectilinear propagation of light	2	To explain the theoritical principles of diffraction	PPT, Lecture,	
V	**Polarization**					
	1	Introduction – Polarization – Unpolarized and polarized light – Types of polarization	2	To explain the polarization of light	Lecture, PPT	Formative assessment (II & III),

	2	Production of plane polarized light – Polarizer and analyser – Anisotropic crystals – Double refraction	3	To explain the polarization and double refraction in crystals	Lecture.	
	3	Ordinary and extra ordinary ray – Positive and negative crystals – Nicol prism – Quarter and half wave plates	4	To discuss the half and quarter wave plates	Lecture, PPT	
	4	Production and analysis of elliptically and circularly polarized light – Analysis of polarized light	6	To analyze the different polarized lights	Lecture	

Course Instructor : Dr. S. Mary Delphine and Dr. Abila Jeba Queen

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Solid State Physics

Subject code : PC1753

No of hours per week	No of credits	Total no of hours	Marks
6	5	90	100

Objectives

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

CO	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

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment /Evaluation
I	**Bonding in Solids**					
	1	Bonding in solids, An over view of an atom, Condition for bonding, Octet rule and stability	**4**	To acquire knowledge on bonding in solids	Lecture Discussion with PPT illustration	Evaluation through short test Multiple choice questions Formative assessment I
	2	Van der Waal's bonding, Ionic bonding, Covalent bonding	**3**	To understand the different kinds of bonding	Lecture discussion with PPT illustration	
	3	Dipole-dipole interactions, Hydrogen bonding, Metallic bonding, Mixed bonding	**4**	To acquire knowledge on hydrogen, metallic and mixed bonding	Lecture discussion	

	4	Calculation of ionization energies for compounds, Comparison of physical properties	**4**	To be able to determine the ionization energies	Lecture discussion	
II	**Crystalline Materials**					
	1	Classification of solids, Periodicity in crystalline solids, Lattice translation vectors	**4**	To understand the concept of crystal structure.	Lecture Illustration	Short test Quiz Assignment Formative assessment I
	2	Unit and primitive cells, Bravais lattices, Symmetry operations	**4**	To acquire knowledge on unit cells and bravais lattices	Lecture discussion	
	3	Crystal indexing, Miller indices of lattice planes, Directions in crystals, Atomic packing factor (APF)	**4**	To be able to determine the miller indices of lattice planes	Lecture discussion	
	4	Density and lattice constant, Other common crystal structures	**3**	To acquire knowledge on other crystal structures	Lecture Illustration	
III	**Magnetic Materials**					
	1	Magnetic and nonmagnetic materials, Magnetic dipole compared with electric dipole	**3**	To be able to distinguish between magnetic and nonmagnetic materials	Lecture with PPT Illustration	Short test Quiz Formative assessment II
	2	Important terms in magnetism, Sources of permanent magnetic moment	3	To know the important terms in magnetism	Lecture with PPT Illustration	
	3	Classification of magnetic materials, Theory of diamagnetism, Classical theory of para magnetism, Theories of ferromagnetism, The Weiss exchange (molecular) field	5	To know the classical theory involved in Dia and Para magnetism	Lecture with PPT Illustration	
	4	Domain theory, Hysteresis, Hard and soft	4	To acquire knowledge	Question-answer	

		magnetic material, Antiferromagnetism Ferrimagnetism		on ferro, ferri and antiferro magnetism	session Lecture	
IV	**Dielectric Materials**					
	1	Dielectrics, Polarizability and dielectric constant, Types of polarization	4	To acquire knowledge on Dielectrics, Polarizability and dielectric constant	Lecture Discussion	Formative assessment II
	2	Langevin's theory of polarization in polar dielectrics, Piezoelectric materials, Ferroelectrics, Antiferroelectricity	3	To acquire knowledge on piezoelectric and ferroelectric materials	Lecture Discussion	
	3	Internal or local field, Clausius Mossotti equation, Lorentz-formula, Frequency and temperature effects on polarization	4	To be able to understand the effects of Frequency and temperature on polarization	Lecture Discussion	
	4	Dielectric breakdown, Dielectric loss, Classification of insulating materials, Important insulating materials	4	To be able to classify the insulating materials	Brain storming session. Lecture Discussion	
V	**Semiconductors and Superconductors**					
	1	Bands in solids , Elemental and compound semiconductors, Conduction in semiconductors, Band structure of semiconductors	4	To acquire knowledge on elemental and compound semiconductors	Lecture with PPT	Short test Formative assessment III
	2	Concentration of charge carriers, Mobility and conductivity in semiconductors	3	To understand the concept of mobility and conductivity	Lecture Illustration	
	3	Discovery of superconductivity, Superconductivity and	4	To understand the properties of superconductors	Lecture with PPT	

		magnetism, Critical magnetic field, Meissner effect, Magnetic induction in superconductors			Illustration	
	4	Type I and Type II Superconductors, Isotope effect, Applications of superconductors	4	To understand the significance and applications of superconductors	Lecture with PPT	

Course Instructor : Dr. C. Nirmala Louis

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Programming with C++

Subject code : PC1754

Number of hours per week	No of credits	Total number of hours	Marks
5	4	75	100

Objectives:

1. To apply C++ language to write simple programs for solving general Physics problems
2. To enable the students developing their own Applications using C++ and evolve as efficient software programmers

CO	Upon completion of this course, students will be able to:	PSO	CL
CO - 1	describe the principles of object oriented program. (abstraction, encapsulation, inheritance and polymorphism)	PSO - 4	C
CO - 2	apply object oriented programming techniques to solve computing problems.	PSO - 4	Ap
CO - 3	develop programs using functions and classes. (objects, array of objects, friend functions, passing and returning objects)	PSO - 4	C
CO - 4	develop programs using constructor, destructor, operator overloading and inheritance.	PSO - 4	C
CO - 5	formulate the applications of pointers and virtual functions.	PSO - 4	C

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Principles of object oriented Programming**					
	1	Object-oriented programming, paradigm, Basic concepts of object oriented pro gramming	3	To understand the basic concepts of object oriented pro gramming	Lecture Discussion with PPT illustration	Evaluation through short test Multiple choice questions Formative assessment I
	2	Benefits of OOP, Object-oriented languages, Applications of OOP	3	To know the benefits and applications of OOP	Lecture discussion with PPT illustration	
	3	Introduction to C++ and its applications, A simple C++ program – An example with class	3	To be able to write a simple program in C++	Lecture discussion	
	4	Structure of C++ program, Creating the source file, Compiling and Linking	3	To be able to understand the structure of C++ program	Lecture discussion	
II	**Tokens, Expressions and Control Structures**					
	1	Introduction, Tokens, Keywords, Identifiers and constants	3	To understand the concept of Tokens, Keywords, Identifiers and constants	Lecture Illustration	Short test Quiz Assignment Formative assessment I
	2	Basic data types, User defined data types, Storage classes, Derived data types, Symbolic constants	3	To acquire knowledge on basic and user defined data types	Lecture discussion	
	3	Declaration of Variables, Dynamic initialization of variables, Reference variables	3	To understand the concept dynamic initialization of variables	Lecture discussion	
	4	Operators in C++, Scope resolution	3	To acquire knowledge on	Lecture	

		operator, Memory management operator		operators	Illustration	
III	**Functions, Classes and Objects**					
	1	The main function, Function prototyping, Call by reference, Return by reference	3	To acquire knowledge on main function and function prototyping	Lecture with PPT Illustration	Short test Quiz Formative assessment II
	2	Inline functions, Default arguments, Constant arguments, Function overloading, Friend and virtual functions	3	To be able to understand the concept functions	Lecture with PPT Illustration	
	3	Specifying a class, Defining member function, A C++ program with class, Making an outside function inline, Nesting of member functions	3	To be able to specify a class	Lecture with PPT Illustration	
	4	Private member functions, Arrays within a class, Memory allocation for objects, Static data members, Static member functions, Arrays of objects, Friendly functions	3	To acquire knowledge on arrays within a class and arrays of objects	Question-answer session Lecture	
IV	**Constructors, Destructors and Operator overloading**					
	1	Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects	3	To understand the concept constructors	Lecture Discussion	Formative assessment II

	2	Copy constructor, Dynamic constructors, Constructing two dimensional arrays, Destructors	3	To acquire knowledge on copy constructor and dynamic constructors	Lecture Discussion	
	3	Defining Operator overloading, Overloading Unary operators, overloading, Binary operators, Overloading Binary operators using friends	3	To be able to understand overloading operators	Lecture Discussion	
	4	Manipulation of strings using operators, Rules for overloading operators	3	To understand the rules for Overloading operators	Brain storming session. Lecture Discussion	
V	**Inheritance, Pointers and Virtual functions**					
	1	Defining derived classes, Single inheritance, Making a private member inheritable	3	To acquire knowledge on inheritance	Lecture with PPT	Short test Formative assessment III
	2	Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.	3	To be able to distinguish between multilevel inheritance and multiple inheritance	Lecture Illustration	
	3	Pointers, Pointers to objects, Pointers to derived classes	3	To acquire knowledge on pointers	Lecture with PPT Illustration	
	4	Virtual functions, Virtual constructors and destructors.	3	To understand the significance of virtual functions	Lecture with PPT	

Course Instructor : Dr. M. Priyadharshini and Dr. A. Lesly Fathima

Head of the Department : Dr. S. Mary Delphine