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 – work done by spring force – potential energy – conservative and non conservative forces – potential energy curve	**2**	To be able to derive the workdone by gravitational and spring force and distinguish conservative and non conservative forces	Lecture discussion 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
Course Name: Heat and Thermodynamics
Course Code: PC2031

Hours /Week	Credits	Total Hours	Marks
4	**4**	**60**	**100**

Objectives

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

Course Outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	understand experimental methods to determine the transmission of heat.	**PSO - 4**	**U**
CO-2	analyze the work and heat interactions associated with a prescribed process path and to perform a analysis of a flow system	**PSO - 1**	**An**
CO-3	understand the basic concepts of thermodynamics like system, properties, equilibrium, pressure, specificvolume, temperature and the laws of thermodynamics	**PSO - 4**	**U**

CO-4	evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process fromsuch calculations.	**PSO - 3**	**An**
CO-5	analyze Maxwell's thermo dynamical relations and their applications	**PSO - 5**	**E**

Teaching Plan

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

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Thermometry and Calorimetry**					
	1	Platinum resistance thermometer - Calendar and Griffith's bridge	1	Describe the theory behind different thermometers	Lecture discussion PPT	Multiple Choice Questions
	2	Thermoelectric effect – Seebeck effect - Thermoelectric thermometers- International temperature scale – Thermistor-	2	Able to explain thermoelectic effects	Lecture demonstration PPT	Quiz,
	3	Specific heat capacity of Solids – Regnault's method of mixtures(solid) – specific heat capacity of liquids – Callendar and Barnes method.	3	Able to determine the specific heat capacity of solids and liquids	Lecture demonstration PPT	Formative Assessment I

	4	Specific heat capacity of gases – Cp and Cv – Meyer's relation – Cv by Joly's differential steam calorimeter method – Cp by Regnault's method.	3	Able to determine the specific heat capacity of gasses.	PPT Lecture discussion	Assignment

II	**Low Temperature Physics**					
	1	Joule - Kelvin effect - Liquefaction of Air-Linde's Process –liquefaction of hydrogen - liquefaction of helium-Kammerling - Onne's method	3	Describing the process of liquefaction of gases by various methods	Lecture discussion PPT	Formative Assessment I &II
	2	Helium I and II - Lambda point - production of low temperatures - adiabatic demagnetization	3	Explain about the production of low temperatures	Lecture demonstration PPT	Multiple choice questions
	3	Practical applications of low temperature - refrigerators and air- conditioning machines - super fluidity - application of super fluidity.	3	Discuss about fluidity, low temperature and applications based on it	Group discussion, PPT	Quiz
III	**Transmission of Heat**					
	1	Conduction – coefficient of thermal conductivity – Rectilinear flow of heat along a bar	2	Explain the conduction process and rectilinear heat flow.	Lecture discussion, PPT	Multiple choice questions
	2	convection – lapse rate – Stability of the atmosphere – Newton's law of cooling – determination of specific heat capacity of liquid	3	Discuss the convection process of heat transfer.	Lecture discussion & Demonstration, PPT	Formative Assessment I &II

	3	Radiation - black body – Kirchhoff's law – Stefan – Boltzmann law- solar constant – water flowpyroheliometer.	2	Describe the process of radiation and laws associated with it.	PPT Lecture discussion	Short Test Quiz
	4	Energy distribution in black body spectrum - Wien's law – Rayleigh Jean's law– Planck's law	2	Comparing the theoretical and experimental results of energy distribution in black body.	Group discussion, PPT	Assignment
IV	**Kinetic Theory of Gases**					
	1	Kinetic Theory of gases- assumptions - Molecular collisions – mean free path – expression for mean free path	2	Able to explain the motion of gas molecules	Lecture discussion, PPT	Multiple choice questions
	2	Transport phenomenon – Brownian motion and its features - expression for viscosity, Diffusion and thermal conductivity of gas.	4	Describe the movement of molecules into different layers thus understanding the transport of gas	Lecture discussion & Demonstration, PPT	Formative Assessment I
	3	Experimental verification -Vander Waals' equation of state - Determination of Vander Waals' constant - Relation between Vander Waals' constant and critical constants.	3	Explain the correction in Ideal gas equation and finding the constants of correction and their relations	Lecture demonstration PPT	Short Quiz
V	**Thermodynamics**					

	1	Zeroth and first law of thermodynamics – reversible and irreversible processes – isothermal process-adiabatic process-gas equation during adiabatic process - work done during adiabatic and isothermal process	3	Discuss the zeroth law and first law of thermodyna modynamics	Lecture discussio n, PPT	Multiple Choice Questions
	2	second law of thermodynamics – Carnot's engine – its efficiency. Entropy – change of entropy in reversible and irreversible processes – temperature – entropy diagrams – physical significance of entropy - change of entropy when ice converted into steam	2	Discuss the law of thermodyna modynamics and entropy concept	Lecture discussio n, PPT	Quiz,
	3	third law of thermodynamics – Extensive and Intensive thermodynamic variables – distinction between them Maxwell thermodynamical relations – derivation and application - Clausius - Clapeyron equation and specific heat relation	4	Analyze and study the applications maxwells relation	Group discussio n, PPT	Formative Assessment II

Course Instructor: Dr.M.Abila Jeba Queen

Semester **III**

Course Name : Non Conventional Energy Sources -Elective – I(a)

Course Code : PC2032

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

Learning Objectives

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

Course Outcome

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

Modules

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Introduction to Energy Sources**					
	1	World's reserve of Commercial energy sources and their availability	3	To understand the energy resources available in Word	Illustration and lecture	Evaluation through: quiz, short questions
	2	India's production and reserves	2	To understand the availability of energy resources in India	Illustration and lecture	
	3	Conventional and non-conventional sources of energy, comparison	2	To compare Conventional and non-conventional	Illustration and lecture	Formative assessment

				sources of energy		
	4	Coal- Oil and natural gas – applications - merits and demerits.	2	To know the merits and demerits of fossil fuels	Illustration and lecture	
II	**Solar Thermal Energy**					
	1	Solar constant -Solar spectrum	0.5	To understand the phenomena of solar activity	Illustration, demonstration and lecture	Evaluation through: quiz, Multiple choice, questions, Formative assessment
	2	Solar radiations outside earth's atmosphere –at the earth surface- on tilted surfaces	2.5	To understand the basic concepts of solar radiation towards earth	Illustration, demonstration and lecture	
	3	Solar Radiation geometry	0.5	To understand the different terms with solar radiation geometry	Illustration, lecture and Demonstration	
	4	Basic Principles of Liquid flat plate collector	1	To understand the principles of solar collector	lecture and Demonstration	
	5	Materials for flat plate collector -Construction and working	1.5	To explain the construction and working of Flat plate collector	Group Discussion	Multiple choice, questions,
	6	Solar distillation- Solar drying- Solar cooker (box type)-Solar water heating systems – Swimming pool heating.	3	To design the various Pollution free energy resources	Lecture with ppt, Group Discussion	Exhibiting Models, Formative assessment
III	**Photovoltaic Systems**					

	1	Introduction-Photovoltaic principle-Basic Silicon Solar cell- Power output and conversion efficiency	3	To understand the basic principle of Solar cell and study its efficiency	Lecture with ppt, Group Discussion	Evaluation through: quiz, Assignments Multiple choice questions Descriptive answers Formative assessment
	2	Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages	3	Able to utilize the solar energy for generating power	Lecture discussion	
	3	Types of solar cells	1	Able to discuss about the various types of solar cell	Lecture discussion	
	4	Application of solar photovoltaic systems - PV Powered fan – PV powered area - lighting system – A Hybrid System.	3	Apply the solar energy in various sectors	Lecture discussion	
IV	**Biomass Energy**					
	1	Introduction-Biomass classification- Photosynthesis - Biomass conversion technologies-Bio-gas generation-Factors affecting bio-digestion	3	To understand the fundamentals of Biomass conversion processes& devices	Lecture discussion	Evaluation through: quiz Assignments Short questions Descriptive answers

						Formative assessment
	2	Working of biogas plant-floating and fixed dome type plant -advantages and disadvantage	3	To bring awareness from a technical point of view of Bio gas plants	Lecture, Illustration, Group discussion	
	3	Bio-gas from plant wastes	1	To understand and apply the concept of production of bio-gas from plant wastes	Lecture, Illustration, Group discussion	
	4	Methods for obtaining energy from biomass. Advantage & disadvantages of biomass as energy source	2	To discuss about the generation of biogas from biomass	Lecture discussion	
V	**Wind Energy and Other Energy Sources**					
	1	Wind Energy Conversion-Classification and description of wind machines, wind energy collectors-Energy storage	3	To understand the basic concepts of WECS system	Illustration, lecture, Demonstration	Evaluation through: quiz, Assignments on applications Formative assessment
	2	Energy from Oceans and Chemical energy resources-Ocean thermal energy conversion-tidal power, advantages and limitations of tidal power generation-Energy and power from waves- wave energy conversion devices	3	To understandthe basic conceptsof OTEC and Wave energy	Lecture, Demonstration,	
	3	Fuel cells- and application of fuel cells- batteries- advantages of battery for bulk energy storage- Hydrogen as alternative fuel for motor vehicles.	3	To understandthe basic conceptsof Chemical energy	Lecture, Demonstration,	
	4					

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

Course Instructors: Dr. R. Krishna Priya& Ms. P. AjiUdhaya

Semester III

Course Name : Allied Physics I for Chemistry

Course code : AP2031

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

Learning Objectives

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

Course Outcome

COs	Upon completion of this course students will be able to:	PSO addressed	CL
CO- 1	Understand to know, various modulus involved in the materials, flow of liquids due to viscous forces, transmission of heat due to process of conduction, convection and radiation and various laws involved in heat transformation, various thermodynamic laws and.	PSO-1	U
CO -2	Analyze the concepts and study the concept of entropy, and the phenomenon like interference and diffraction, optical activity of liquids and its uses.	PSO -3	An
CO- 3	Apply their depth knowledge of Physics in day today life.	PSO -2	Ap
CO- 4	Develop their knowledge and carry out the practical by applying these concepts	PSO -4	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 conceptsof Young's modulus and itsdefinition	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 Expressionfor bending moment	Illustration and theoretical derivation	
	2	Determination of Young' modulus – uniform and non uniform bending. Expression for Couple per unit twist	3	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 oftorsion pendulum	Lecture and theoretical derivation	
II	**Conduction in solids**					
	1	Thermal conductivity – Lee's disc method – Relation between thermal and electrical conductivities - Widemann – Franz law	3	To understand the basic concepts of conduction phenomena and derive related laws	Illustration, theoretical derivation and lecture	Evaluation through: quiz, short questions Multiple choice, questions , Deriving theoretical formulas Formative assessment
	2	Convection: Newton's law of cooling – Determination of specific heat capacity of liquid	3	To understand the basic concepts of convection phenomena and derive related laws	Illustration and theoretical derivation	
	3	Radiation: Distribution of energy in the spectrum of black body – Results.	3	To understand the basic concepts of radiation phenomena and derive related laws	Illustration, theoretical derivation and Demonstration	
	Viscosity					

III	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 questions
	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	Multiple choice, questions , Deriving theoretical formulas Formative assessment
	3	Bernoulli's theorem – Statemen and proof – Venturimeter – Pitot tube.	3	To understand the concept of venturimeter and Pitottube.	Lecture , Illustration, Theoritical formulation Practical	
IV	**Thermodynamics**					
	1	Zeroth and First Law of thermodynamics – Second lawof 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 itsapplication	Illustration, Theoretical formulation, Demonstration	Evaluation through: quiz, Deriving theoretical formulas
	2	Diffraction – Differencebetween diffraction and interference –	3	To understandthe basic conceptsof	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 understandthe basic conceptsof 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. S. Virgin Jeba

Teaching Plan (2019-2020)
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 differenti ate 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 Limitatio ns 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 Schrodin ger 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 Illustratio n	
	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