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 II
Course Name : PROPERTIES OF MATTER AND SOUND
Course code: PC2021

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objective

To expose students to the fundamentals of properties of matter and sound.

Course Outcomes

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO- 1	identify the materials suitable for construction of buildings, based on the moduli of elasticity.	PSO-4	Ap
CO- 2	paraphrase the properties of liquids and its determination.	PSO-1	U
CO- 3	analyze the physics of sound and its applications	PSO-2	An
CO- 4	integrate the concepts of acoustic comfort and better understanding of the theories used in building acoustics	PSO-3	Ap

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Elasticity**					
	1	Elasticity –- Hooke's law – Elastic moduli – Poisson's ratio –	2	To understand the concept elasticity and	Lecture	Evaluation through short test

		Beams – Bending of beams – Expression for bending moment –		bending of beams	Discussion with PPT illustration	Multiple choice questions Formative assessment I
	2	Cantilever- Theory of uniform and non – Uniform bending - Determination of Young‘s modulus	2	To be able to determine the Young’s modulus of the material	Lecture discussion with illustration	
	3	Koenig's method – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire	3	To acquire knowledge on Work done in twisting a wire	Lecture discussion	
	4	Torsional oscillations of a body - Rigidity modulus by dynamic torsion method (Torsional pendulum) and static torsion method	2	To be able to distinguish between dynamic torsion method and static torsion method	Lecture discussion	
II	**Surface Tension**					
	1	Surface tension – definition – Molecular forces – Explanation of surface tension on kinetic theory – Surface energy	3	To understand the concept of surface tension according to kinetic theory	Lecture Illustration	Short test Quiz Assignment Formative assessment I
	2	Work done in increasing the area of a surface – Excess pressure inside a curved liquid surface – Excess pressure inside a spherical	3	To determine the excess pressure inside a spherical and cylindrical drops and bubbles	Lecture discussion	

		and cylindrical drops and bubbles				
	3	Drop weight method - Angle of contact- Quincke's method- variation of surface tension with temperature- Experimental determination- Jaegar's method	3	To evaluate the principle of surface tension in liquids and understand it by practical experiments.	Lecture Illustration	
III	**Viscosity**					
	1	Viscosity – Co efficient of viscosity – Streamlined and turbulent motion – Critical velocity	3	To have practical knowledge on determining the coefficient of viscosity of a liquid.	Lecture with PPT Illustration	Class test Quiz Formative assessment II
	2	Rate of flow of liquid in a capillary tube – Poiseuille's formula – Viscosity of highly viscous liquid	4	To understand the concept of pressure and thrust.	Question-answer session Lecture	
	3	Terminal velocity - Stoke's method - Ostwald Viscometer - Viscosity of gas- Mayer's formula- Rankine 's method	3	To evaluate Stoke's formula and apply it in experiment to understand the viscous force of a liquid.		
IV	**Sound**					
	1	Simple harmonic motion – Differential equation of motion	3	To derive the solution of the differential	Lecture Discussion	Short test

		executing S.H.M. – Solution of the differential equation of motion		equation for a simple harmonic motion		Quiz Formative assessment II
	2	Composition of two S.H.M. along the same direction and at right angles – Lissajous figure – Free, damped and forced vibration	3	To distinguish between Free, damped and forced vibration	Lecture Discussion	
	3	Frequency of vibrating string- Melde's experiment and verification of the laws of transverse vibration of a string- Sonometer – Loudness level- Sound Intensity measurement	3	To acquire skills to do experiments by sonometer and Melde's string.		
V	**Ultrasonics and Acoustics**					
	1	Ultrasonics – Production – Piezoelectric crystal method – Magnetostriction method – Properties and Applications	3	To compare the methods of ultrasonic production.	Lecture with PPT	Class test Formative assessment III
	2	Acoustics of building – Reverberation- Sabine's Reverberation formula (No derivation) - Factors affecting acoustics	5	To classify sound and to examine the architectural acoustics	Brain storming session. Lecture Illustration	

		of building- Sound distribution in an auditorium- Requisites for good acoustics				

PO- Program outcome; LO – Learning outcome; Cognitive Level U – Understand; Ap- Apply, An- Analyze;

Course instructors: Dr.A.Lesly Fathima and Sr.S.Sebastiammal

Semester : II

Name of the Course : Allied Physics II

Subject code : AP2021

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	Acquire knowledge on elementary ideas of electricity and magnetism, electronics, optics and nuclear physics.	PSO-1	U
CO 2	Analyze the concepts and study their applications in the field of electricity and magnetism, electronics, optics and nuclear physics.	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	Ap

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment / Evaluation
I	**Quantum Mechanics and Relativity**					
	1	Wave mechanics – expression for group velocity – Davison Germer's experiment – Heisenberg's uncertainty principle – basic postulates of wave mechanics – time dependent form of Schrodinger equation – properties of wave function.	2	To understand the basic concepts of wave mechanics	Illustration and lecture	Evaluation through: quiz, short questions Multiple choice, questions , Deriving theoretical Formulas Problem solving Formative assessment
	2	Heisenberg's uncertainty principle – basic postulates of wave mechanics – time dependent form of Schrodinger equation – properties of wave function.	2	To study the basic postulates of wave mechanics and derive Schrodinger equation	Illustration and theoretical derivation	
	3	Relativity – frame of reference – Newtonian relativity – Galilean transformation equations.	2	To understand Relativity and frame of reference	Illustration, theoretical derivation and Practical	
	4	Special theory of relativity – Lorentz transformation equations.	3	To derive Lorentz transformation equations.	Lecture and theoretical derivation	
II	**Nuclear Physics**					
	1	Nuclear constituents - size - mass - spin and charge - binding energy - binding energy curve	3	To understand the basic concepts of nuclear physics and study its units	Illustration, Theoretical formulation, Problem Solving	Evaluation through: quiz, short test Assignment on applications.
	2	Nuclear fission - chain reaction - nuclear reactor - radioactive disintegration	3	To determine nuclear fission	Lecture, Theoretical formulation	

				and radioactive disintegration		Formative assessment
	3	Half life period - radiation hazards.	2	To understand the causes of radiation hazards	Lecture, Illustration,	
III	Electricity & Magnetism					
	1	Electric curent - current density - Ohm's law - Electrical conductivity - Kirchhoff's law	2	To understand the basic concepts of current and laws	Illustration and lecture	Evaluation through: quiz, short questions, Multiple choice, questions, Deriving theoretical formulas Formative assessment
	2	Wheatstone's bridge - condition for balance - potentiometer - calibration of voltmeter and ammeter.	2	To study the basic of potentiometer , voltmeter and ammeter	Illustration and theoretical derivation. Practical	
	3	Electromagnetic induction - laws of electromagnetic induction - Faraday's law - Lenz law	2	To understand the basic concepts of electromagnetic induction through experiment	Illustration, theoretical derivation and Demonstration	
	4	Flemings right hand rule - self-inductance - mutual induction - coefficient of coupling.	2	To define convection mode of heat transfer and study its application	Illustration and lecture	
IV	**Electronics**					
	1	Formation of p-n junction diode – forward and reverse biasing of a junction diode	2	To understand the basic concepts of electronics	Lecture, Demonstration, theoretical formulation	Evaluation through: quiz, short questions Multiple choice, questions, Deriving theoretical
	2	Zener diode - characteristics of the Zener diode – diode as a half wave and full wave rectifiers.	2	To analyse the various aspects of zener diode	Lecture, Demonstration, theoretical formulation	
	3	Bipolar junction transistor –	2	To understand the concept of	Lecture, Demonstration,	

		junction transistor – CE characteristics of a transistor		Bipolar junction transistor	theoretical formulation	formulas Formative assessment
	4	Field effect transistor – drain characteristics of an n channel JFET.	2	To understand the concept of Field effect transistor	Lecture, Demonstration, theoretical formulation	
V	**Digital Electronics**					
	1	Digital logic gates – AND – OR – NOT gate – NAND and NOR as universal gates – integrated circuit – EX-OR gate	3	To understand the basic concepts of logic gates	Illustration, Theoretical formulation, Demonstration	Evaluation through: quiz, Deriving theoretical formulas Assignment on applications Formative assessment
	2	Boolean algebra– half adder – full adder – half subtractor.	2	To understand the basic concepts of Boolean Algebra	Lecture, Demonstration, Theoretical formulation	
	3	Decimal system – Binary system –conversion – binary addition – binary subtraction using 2s complement – binary multiplication – binary division.	3	To understand the number system and binary operations	Lecture, Demonstration, Theoretical formulation	

PO- Program outcome; LO – Learning outcome; Cognitive Level U – Understand; Ap- Apply, An- Analyze;

Course Instructor: Ms.P. Aji Udhaya &Sr.S.Sebastiammal

Semester II

Course Name : Physics in Everyday life – II

Course Code: PNM202

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

Objectives

1. To provide basic knowledge on the concepts of light, Electromagnetism and Electronics along with some applications.
2. To explain the wonders in universe using the principles of physics

. Course Outcomes

CO	Upon completion of this course, students will be able to:	CL
CO - 1	understand the principle and working of simple devices used in day to day life.	U
CO – 2	identify the symbols used for various electronic components and infer the electronic tools.	R
CO – 3	distinguish different heavenly bodies (star, planet, comets, galaxies)	R
CO - 4	recall various applications of physics concepts in everyday life	K

Teaching Plan

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

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Light**					
	1	Introduction - Nature and properties of light - Reflection - Colours of light - Colours of objects- Reflection in everyday life	1	To understand the fundamental concepts of light	Lecture, PPT	Quiz test, Formative assessment
	2	Refraction - Dispersion – Rainbow formation- Refraction in everyday life	2	To understand the fundamental phenomenon of light	Lecture, Demonstration	
	3	Laser: principle and applications - Fiber optics and its applications - Applications of light in day to day life	1	To understand the principles and applications of	Lecture	

				Laser and fiber optics in day to day life		
II	**Electromagnetic Radiation**					
	1	Introduction- Properties of Electromagnetic waves - EM Spectrum- Radio sub spectrum	1	To understand the basic properties of electromagnetic radiation	Lecture, Demonstration	Quiz test, Formative assessment
	2	Cell phones, Microwaves - Microwave oven and sensor, Terahertz radiation and its applications	2	To apply electromagnetic radiations in electrical and electronic appliances	Lecture, Demonstration	
	3	Infra red rays in everyday life – Infra Red and microwaves - comparison - visible light waves - UV rays and its applications	1	To understand and apply the uses of microwave, infrared and visible light in day to day lie	Lecture	
III	**Electromagnetism**					
	1	Introduction - Magnetic materials - Magnetic Field in and around a bar Magnet, Magnetic Fields in and around Horseshoe magnet, Magnetic lines of force	2	To understand Magnetic Field and magnetic force	Lecture	Quiz test, Formative assessment (II)
	2	Electric charge - Ohm's Law - Practical Applications of Ohm's Law in Daily Life	1	To understand Ohm's Law and the applications of Ohm's law	Lecture, PPT	
	3	Electromagnetism- Applications of electricity and magnetism: Credit card machine, Use of electromagnetism in daily life.	1	To apply the applications of electricity and magnetism in digital technology		
IV	**Basic Electronics**					
	1	Introduction - Electronic components - Electronic tools	1	To understand and apply the basic electronic components	Lecture	Quiz test, Formative assessme

				and electronic tools		nt (II)
	2	Semiconductors and integrated circuits - Application of electronic devices	1	To understand Ohm's Law and the applications of Ohm's law	Lecture, PPT	
	3	Electromagnetism- Applications of electricity and magnetism: Credit card machine, Use of electromagnetism in daily life.	2	To apply the applications of electricity and magnetism in digital technology		
V	**Space Physics**					
	1	Introduction - The big bang theory - Stars-Star system, multiple star, supernova, black hole - solar system	1	To understand the stars and the solar system	Lecture	Quiz test, Formative assessment (II)
	2	Terrestrial and Jovian planets - Asteroids- Meteoroids - Meteors - Comets	2	To understand the planets, comets and asteroids	Lecture	
	3	Galaxy - Eclipse: solar and lunar - seasons	1	To understand the seasonal changes	Lecture	

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

Semester :IV

Course Name: Optics and Spectroscopy

Course Code : PC2041

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

Learning Objectives

1. To provide knowledge on the concept of aberrations in lenses, prisms and Spectroscopy.
2. To understand the phenomenon like interference, diffraction, polarization through wave nature of light and itsapplications.

Course Outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO- 1	gain knowledge of geometric optics, helps in the practical design of many optical systems and instruments including aberrations in lens system.	**PSO - 2**	**U**
CO- 2	determine the behavior of a ray and wave at any optical surface.	**PSO - 1**	**R**
CO- 3	analyze the intensity variation of light due to polarization, interference and diffraction.	**PSO - 4**	**An**
CO- 4	study the phenomena: interference, diffraction, and polarization lays the foundation for an understanding of concepts such as as holograms, interferometers.	**PSO -5**	**E**
CO- 5	gain knowledge on spectroscopy helps to extract the dynamic information about the molecule.	**PSO - 3**	**Ap**

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Geometrical optics**					
	1	Lens – Spherical aberration in lenses – Methods of minimizing spherical aberration	3	To understand the spherical aberrations in lenses	Illustration and lecture	Evaluation through: quiz, short questions Multiple choice, question s, Formative assessment
	2	Dispersion – Angular and Chromatic dispersion – combination of prisms to produce i)dispersion without deviation ii) deviation without dispersion	3	To define and understand angular and Chromatic dispersion	Illustration and lecture	
	3	Direct vision spectroscope – Eyepieces – Ramsden's and Huygens's eyepieces	2	To explain spectroscopes and various eyepieces	Illustration and lecture	
	4	Simple microscope (magnifying glass)– compound microscope	1	To compareSimple and compound microscope	Group discussion and lecture	
II	**Interference**					
	1	Conditions for interference – Theory of interference fringes – interference due to reflected light (thin films)	3	To understand the basic concepts of interference and its condition	Illustration, demonstration and lecture	Evaluation through: quiz, Multiple choice, question s, Exhibiting Models, Formative assessment
	2	Colours of thin films – wedge shaped thin film – theory – determination of diameter of a thin wire by Air wedge	2	To determine the diameter of any thin wire using air-wedge method	Demonstration and lecture	
	3	Test for optical flatness – Newton's rings by reflected light	2	To test the optical flatness	Group discussion	
	4	Determination of wavelength of light - Michelson's Interferometer – theory and its Application (Measurement of wavelength)	2	To determine the wavelength of light source	lecture and Demonstration	
III	**Diffraction**					
	1	Fresnel's diffraction – Rectilinear propagation of light – zone plate – action of zone plate - Fraunhofer diffraction at single slit – Double slit	3	Differentiate Fresnel's and Fraunhoffer diffraction	Lecture discussion, PPT	Evaluation through: quiz, Assignments

	2	Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength (Normal incidence method) –resolving power	3	Discuss the theory of plane transmission gratig	Lecture discussion &Demonstration, PPT	Multiple choice questions
	3	Rayleigh's criterion for resolution – resolving power of a telescope – resolving power of a microscope – resolving power of a prism - resolving power ofgrating.	3	Evaluate the resolving power of various optical devices	Lecture demonstration	Descriptive answers Formative assessment
IV	**Polarisation**					
	1	Double refraction –Nicol Prism – Nicol Prism as polarizer and analyzer – Huygens's explanation of double refraction in uniaxial crystals	3	To explain the basic principles & phenomena of polarisation	Lecture discussion, PPT	Evaluation through: quiz Assignments
	2	Plane, elliptically and circularly polarized light– Quarter wave plates and Half wave plates – Production and detection of plane, circularly and elliptically polarized light	3	To analyze different types of polarization	Lecture Illustration	Short questions Descriptive answers
	3	Optical activity– Fresnel's explanation of optical activity	3	Determine the various optical parameters by using optical components	Lecture discussion PPT	Formative assessment
V	**Spectroscopy**					
	1	Infrared spectroscopy – sources and detector – uses – ultraviolet spectroscopy – sources – quartz spectrograph - applications -	4	Explain UV & IR spectroscopy and its applications	Lecture discussion, PPT	Evaluation through: quiz, Assignments on applications
	2	Raman Spectroscopy Nuclear magnetic resonance –Nuclear quadrupole resonance	2	Discuss the principles of NMR spectroscopy	Lecture discussion, PPT	Formative assessment
	3	Electron spin resonance		Analyze and study the	Group discussion,	

		spectroscopies- (Qualitative study)	3	applications of ESR spectroscopy.	PPT	

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

Course Instructors: Dr. M. Abila Jeba Queen & Dr. R. Krishna Priya

Semester IV

Course Name: Computer Programming in C++

Course code: PC2042

No. of hours per week	No. of Credits	Total No. of hours	Marks
4	**4**	**60**	**100**

Objectives

1. To provide knowledge about the basics of Computer programming in C++ and to solve problems by writing programs.
2. To enable the students developing their own applications using C++.

Course Outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	understand the different types of operators and expressions in C++ language.	**PSO - 4**	**U**
CO-2	implement different operation an arrays and use function to solve the given problem	**PSO - 4**	**Ap**
CO-3	understand member functions and constructors	**PSO - 4**	**U**
CO-4	analyze pointers, operator overloading and inheritance.	**PSO - 4**	**An**
CO-5	analyze input/output operations	**PSO- 4**	**An**

Modules

Credit: 5 **Total Hours: 60**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assesment/ Evaluation

I	**C++ An Introduction**					
	1	Introduction - tokens - keywords - identifiers and constants - declaration of variables - basic data types - user defined data types-derived data types	2	To understand the basics of C++ language	Illustration and PPT	Evaluation through: quiz
	2	Symbolic constants - operators in C++ -expressions and their type-hierarchy of arithmetic operators	3	To understand the types of operators	Illustration, PPT	Formative assessment
	3	Scope resolution operator – declaring, initializing and modifying variables-special assignment operators -	2	To understand the applications of different operators	Lecture Discussion	Evaluation through short test
	4	Control structures- Structure of a simple C ++ program	2	To understand and apply them to solve simple physical problems	Writing simple programme	
II	**Arrays and Functions in C++**					
	1	Introduction - one dimensional and two dimensional arrays - initialization of arrays-array of strings -	1	To understand the declaration of arrays	Illustration	Evaluation through: quiz
	2	Functions-introduction-function with no argument and no return values -function with no argument but return value - function with argument and no return values	3	To understand function and types of function	Lecture, Writing simple programmes	Class test
	3	Function with argument and return values- call by reference return by reference	2	To understand the use of arguments in function	Lecture Illustration , Writing simple programmes	
	4	Function prototyping - inline functions - local, -global and static variables	2	To acquire knowledge on function prototyping	Illustration , Writing simple programmes	

	5	Function overloading - virtual functions-main function-math library functions.	1	To acquire knowledge on library functions	Illustration and PPT	
III	**Classes and Objects**					
	1	Introduction - specifying a class - defining member functions- C++ program with class	2	To understand the basic concepts of object oriented programming	Lecture and Discussion	Evaluation through: quiz Formative assessment Evaluation through short test Multiple choice questions
	2	Nesting of member functions - private member functions - objects as function arguments	2	To understand the access of member functions	Lecture Illustration , Writing simple programmes	
	3	Arrays within a class-array of objects-static class members-friend functions	2	To understand and remember the array declaration and apply	Lecture Illustration , Writing simple programmes	
	4	Constructors - parameterized constructors-multiple constructors - constructors with default arguments - copy constructor.	3	To understand and remember the use of constructors	Lecture Illustration , Writing simple programmes	
IV	**Operator Overloading, Inheritance and Pointers**					
	1	Introduction -defining operator overloading - overloading unary operators -binary operators	2	To understand and remember the operators	Lecture Illustration , Writing simple programmes	Evaluation through: quiz, Problem solving Theoretical derivation Formative assessment
	2	Inheritance - single inheritance – multipleinheritance- multilevel inheritance- hybrid inheritance-hierarchial inheritance	4	To understand and apply the concept of inheritance in solving problems	Lecture Illustration , Writing simple programmes	
	3	virtual base class-abstract class	1	To understand and analyse	Lecture Illustration , Writing simple programmes	
	4	Pointers-definition-declaration-arithmetic operations	2	To understand and apply the concept of inheritance in	Lecture Illustration , Writing simple programmes	

				solving problems		
V	**Managing Console I/O Operations**					
	1	Introduction - C++ stream - C++ stream classes -	2	To understand and remember the stream classes in C++	Lecture Illustration , Writing simple programmes	Evaluation through: quiz, Problem solving Formative Assessment Assignment
	2	unformatted I/O Operations - formatted console I/O operations	2	To understand ,analyse and apply in solving problems	Lecture Illustration , Writing simple programmes	
	3	Working with files - classes for file steam operations	2	To understand ,analyse and apply in solving problems	Lecture Illustration , Writing simple programmes	
	4	Opening and closing a file - file pointers and their manipulations.	3	To understand ,analyse and apply in solving problems	Lecture Illustration , Writing simple programmes	

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

Semester III
Course Name: Allied Physics II for Chemistry

Course Code: Subject 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 concepts of resistance of materials, capacity of conductors, effect of magnetic
   field due to passage of current, idea about the atom models and energy released in breaking of atom.
2. To make an awareness in physical concepts behind electricity , electronics, basicsemiconductor diodes,
   transistor and basic logic gates.

Course Outcome

COs	Upon completion of this course students will be able to:	PSO addressed	CL
CO -1	Acquire knowledge on elementary ideas of electricity and magnetism, electronics, atomic and nuclear physics.	**PSO-1**	**U**
CO- 2	Analyze the concepts and study their applications in the field of electricity and magnetism, electronics and nuclear physics.	**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 the concepts of a rectifier, amplifiers and oscillator, basic digital electronics principles through logic gates and the laws governing them.	**PSO -4**	**R**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Current Electricity**					
	1	Ohm's law – Law of resistance in series and parallel – Specific resistance – capacitors – capacitors in serial and parallel	2	To understand the basic conceptsof Ohm's law , series and parallel,capacitors	Illustration and lecture,PPT	Evaluation through: quiz, short questions Deriving theoretical Formulas Problem solving Formative assessment
	2	Kirchoff's laws – Wheatstone's network – condition for balance Carey-Foster's bridge	3	Explain Kirchoff's laws and Carey-Foster's bridge	Illustration, theoretical derivation and Practical	
	3	Measurement of resistance – measurement of specific resistance –determination of temperature coefficient of resistance	3	Discuss the temperature coefficient of resistance	Lecture and theoretical derivation	

	4.	Potentiometer – calibration of Voltmeter	1	Explain the orking of Potentiometer and calibration of Voltmeter	Illustration, theoretical derivation and lecture	
II	**Electromagnetism**					
	1	Electromagnetic Induction – Faraday's laws – Lenz law	3	To understand the basic concepts of laws of electromagnetic Induction	Illustration, theoretical derivation and lecture	Evaluation through: quiz, short questions
	2	Self Inductance – Mutual Inductance – Coefficient of Coupling A.C. Circuits	3	Dicuss the inductance of the coil and coupling of circuits	PPT, theoretical derivation	Multiple choice, questions ,
	3	Mean value – RMS value – Peak value	1	Derive Mean value , RMS value and Peak value	Illustration, theoretical derivation and Demonstration	Deriving theoretical formulas
	4.	LCR in series circuit – impedance – resonant frequency – sharpness of resonance.	3	Explain the LCR circuit and resonant frequency	PPT, theoretical derivation and Demonstration	Formative assessment
III	**Atomic and Nuclear Physics**					
	1	Bohr's atom model – radius energy – Atomic excitation – Ionization potential	2	To understand the concept of Bohr's atom model	PPT, Lecture and Demonstration	Multiple choice, questions ,
	2	Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect – Binding energy	2	Explain the Frank and Hertz and discuss the Nuclear properties	Lecture , Theoretical formulation Practical demonstration	
	3	Radio isotopes – Uses of radio isotopes – Nuclear fusion and Nuclear fission	3	To understand the concept of Radio isotopes, Uses of radio isotopes Explain the	Lecture , Illustration, Theoretical formulation Practical	Deriving theoretical formulas Formative

				concept of Nuclear fusion and Nuclear fission		assessment
	4.	X-rays – Production – properties –Derivation of Bragg's law – uses in industrial and medical fields	2	Discuss X-rays, properties and applications	Lecture, Demonstration,PPT	
IV	**Analog Electronics**					
	1	Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply.	2	To understand the basic concepts of electronics and various aspects of zener diode	Lecture, Demonstration, theoretical formulation	Evaluation through: quiz, short questions Multiple choice, questions, Deriving theoretical formulas Formative assessment
	2	Transistor – Working of a transistor – CE Configuration – current gain	2	To understand the concept of transistor and its working	Lecture, Demonstration, theoretical formulation	
	3	Transistor Characteristics – CE Configurationβ and αrelationship only	2	To understand the conceptof transistor characteristics	Lecture, Demonstration, theoretical formulation	
	4	CE amplifier – feedback – Hartley oscillator	2	To understand the concept of feedback amplifier and oscillator	Lecture, Demonstration, theoretical formulation	
V	**Digital Electronics**					
	1	Number system – Decimal – Binary – Double Dabble method	2	To understand the number system		Evaluation through: quiz, Deriving theoretical formulas
	2	Binary addition, subtraction and multiplication – conversion of one number system to another number system	2	To understand the binary operations and conversions	Lecture, Theoretical formulation Problem solving	
	3	Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables	2	To understand the basic concepts of logic gates	Lecture, Demonstration,	

				Theoretical formulation Problem solving
4	Laws and theorems of Boolean'salgebra – De Morgan's theorems.	2	To understand the basic concepts of Boolean Algebra	Lecture, Theoretical formulation Problem solving

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

Course Instructors: Ms. S. Virgin Jeba

Head of the Department: Dr. C. Nirmala Louis

DEPARTMENT OF PHYSICS

HOLY CROSS COLLEGE (Autonomous), Nagercoil-629004

III BSc Physics

Teaching Plan

Semester V

Major Core –V

Name of the Course : Classical and Statistical Mechanics

Subject code : PC2051

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

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

Course Outcome

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

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Mechanics of a System of Particles**					
	1	External and internal forces, center of mass	4	To be able to differentiate external and internal forces	Lecture Discussion with PPT illustration	Evaluation through Online quiz Class test Formative assessment I
	2	Conservation of linear momentum- Conservation of angular momentum- Conservation of energy- work- energy theorem-	4	To acquire knowledge on conservation of momentum and Energy	Lecture discussion SLO	
	3	Conservative forces- examples- Constraints-Types of constraints- Examples- Degree of freedom-	4	To understand the different types of constraints	Lecture discussion	
	4.	Generalized coordinates (transformation equations) – Generalized Velocities- Generalized Momentum.	3	To acquire knowledge on Generalized coordinates	Lecture discussion, PPT	
II	**Lagrangian Formulations**					
	1	Principle of virtual work, D'Alembert's principle	4	To know the principle of virtual work	Lecture Discussion with PPT Illustration	Short test Quiz
	2	Lagrange's equation	4	To understand	Lecture	Assignment

		of motion for conservative and non conservative systems		the concept Lagrange's equation of motion	discussion	Formative assessment I
	3	Simple applications- simple pendulum- Atwood's machine- compound pendulum	3	To be able to derive Lagrange's equation of motion in simple systems	Lecture Illustration	
	4	Hamilton's principle- Deduction of Lagrange's equation of motion from Hamilton's principle - Deduction of Hamilton's principle from D'Alembert's principle	4	To acquire knowledge on Hamilton's principle		
III	**Hamiltonian Formulations**					
	1	Phase space- The Hamiltonian function H- Hamilton's Canonical equation of motion	5	To acquire knowledge on Hamiltonian function	Lecture with PPT Illustration	Evaluation through Online quiz Assignment Formative assessment II
	2	Physical significance of H-Deduction of Canonical equation from a variational principle	5	To be able to deduce Canonical equation from a variational principle	Question-answer session Lecture	
	3	Applications- Harmonic Oscillator- Planetary motion- Compound pendulum	5	To be able to derive Hamilton's Canonical equation of motion in simple systems	Lecture discussion with illustration, SLO	
IV	**Classical Statistics**					
	1	Micro and macro	5	To understand	Lecture	Evaluation

		states- The mu-space and gamma space- fundamental postulates of statistical mechanics		the concept Micro and macro states	Discussion	through Online quiz Formative assessment II
	2	Ensembles- different types- Thermodynamical probability - entropy and probability	5	To acquire knowledge on Ensembles	Lecture Discussion	
	3	Boltzmann's theorem- Maxwell- Boltzmann statistics- Maxwell- Boltzmann energy distributive law- Maxwell- Boltzmann velocity distributive law.	5	To acquire knowledge Maxwell- Boltzmann velocity distributive law	Brain storming session. Lecture Illustration	
V	**Quantum Statistics**					
	1	Development of Quantum statistics- Bose- Einstein and Fermi- Dirac statistics-	5	To have clear idea about Quantum statistics	Lecture with PPT	Short test Formative assessment III
	2	Derivation of Planck's radiation formula from Bose–Einstein statistics	5	To be able to derive Planck's radiation formula from Bose Einstein statistics	Brain storming session. Lecture Illustration	
	3	Free electrons in metal- Fermi Gas- Difference between classical and quantum statistics	5	To be able to mention the difference between classical and quantum statistics	Lecture with PPT Illustration	

PO- Program outcome; LO – Learning outcome; Cognitive Level U – Understand; Ap- Apply, An- Analyze;

Course instructors: Dr.A.Lesly Fathima, Dr.S.Sonia and Dr.S.J Jenepha MaryHead of the Department: Dr. C. Nirmala Louis

Holy Cross College (Autonomous), Nagercoil-629004
B.Sc Physics

Semester :V

Name of the Course:Analog Electronics: Major Core –VI

Subject Code : PC2052

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

Learning Objectives

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

Course Outcome

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

Modules

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

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Linear circuit analysis and semiconductor diodes**					
	1	Constant voltage source - constant current source - Maximum power transfer theorem - Thevenin's theorem - procedure for finding Thevenin Equivalent circuit	4	To apply the usage of constant voltage source and current source in Thevenin's circuit	Lecture Discussion and Problem Solving	Evaluation through: quiz, short questions Formative assessment
	2	PN junction theory - V-I characteristics of a PN junction diode - Half wave rectifier - Bridge rectifier - Efficiency	4	To understand the fundamental principles of PN junction. To calculate the efficiency of rectifier circuits	Lecture Discussion and Problem Solving	
	3	filters - Shunt capacitor filter – pi filter - Zener diode - equivalent circuit - voltage regulator	3	To understand the various filter circuits. To study about the usage of filter circuits on voltage regulator	Lecture Discussion and Problem Solving	
	4	LED - V-I characteristics – advantages - applications - photo diode - characteristics applications.	4	To understand the principle and working of LED and photodiode	Discussion and lecture	
II	**Transistor Amplifier**					
	1	Transistor - Different modes of	3	To understand	Demonstration	

		operations-CB mode &CE mode		the different modes of transistor operations	and lecture	Evaluation through: quiz, Multiple choice, question s, Formative assessment
	2	Two port representation of a transistor- h parameter - AC equivalent circuit using h parameters- analysis of amplifiers using h parameters (CE only)	3	To apply the h parameters in analyzing the amplifiers	demonstration and lecture – cum-discussion, Problem Solving	
	3	RC coupled amplifier - transformer coupled amplifier	3	To understand RC coupled and transformer coupled amplifier	Lecture-cum-Discussion and Demonstration	
	4	Power amplifier	2	To understand the principles and working of Power amplifier	Lecture- cum-discussion	
	5	Classification of amplifiers - Class A, Class B and Class C	2	To compare Class A, Class B and Class C amplifiers	Group Discussion and lecture	Multiple choice, question s,
	6	Push pull amplifier – Emitter follower	2	To understand Push pull amplifier and emitter follower	Lecture, Group Discussion	Formative assessment
III	**Oscillators and Multivibrator**					
	1	Principle -effect negative feedback-and Barkhaussen criterion	3	To understand aboutfeedback principle of oscillators	Lecture-cum-discussion, Problem solving	Evaluation through: quiz, Assignments
	2	Phase shift and Wien Bridge oscillators using transistors – Expression for frequency	4	To derive the expression of frequency of phase shift and Wein Bridge oscillators.	Lecture discussion, Problem solving	Multiple choice questions
	3	Multivibrators-Astable and ,Monostable	4	To discuss about Astable and	Demonstration, Lecture-cum-discussion	Descriptive

				MonostableMultivibrators		answers
	4	Bistable multi vibrators using transistors - Schmitt trigger.	4	To discuss about bistableMultivibrator	Demonstration, Lecture-cum-discussion	Formative assessment
IV	**Special Semiconductor Devices**					
	1	Clipping and clamping circuits	3	To understand about clipping and clamping circuits	Lecture-cum-discussion	Evaluation through: quiz Assignments Short questions Descriptive answers Formative assessment
	2	Differentiating circuit - Integrating circuit	3	To construct the differentiator and integrator circuits.	Lecture, Demonstration, Group discussion	
	3	Field effect Transistor FET-MOSFET	3	To understand about FET transistor	Lecture-cum-discussion	
	4	UJT-SCR -characteristics - FET as a VVR	3	To discuss about the characteristics of FET	Lecture-cum-discussion	
	5	UJT relaxation oscillator-SCR as a switch and rectifier	3	The understand about the principles of UJT relaxation oscillator	Lecture-cum-discussion	
V	**Operational Amplifier**					
	1	Operational Amplifier-characteristics-parameters-applications- Inverting amplifier - Non inverting amplifier	4	To understand the basic concepts of operational Amplifier, inverting and non-inverting	Lecture-cum-discussion, Demonstration	Evaluation through: quiz, Assignments on operational amplifier problems Formative assessment
	2	Voltage follower- Adder - Subtractor - Integrator – Differentiator	4	To construct the differentiator and integrator circuits using IC 741	Lecture-cum-discussion, Demonstration	
	3	Solving simultaneous equations-comparator -square wave generator	4	To solve the simultaneous equations using Op-amp.	Lecture-cum-discussion, Demonstration	

	4	Wien bridge oscillator -Schmitt trigger	3	To construct the Schmitt trigger using IC741	Lecture-cum-discussion, Demonstration	

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

Course Instructors: Dr. R. Krishna Priya & Dr. M. Priya Dharshini

HOLY CROSS COLLEGE (Autonomous), Nagercoil-629004

BSc Physics

Semester V

Major Core VII: Solid State Physics

Course Code: PC2053

Hours/Week	Credits	Total hours	Marks
5	5	75	100

Learning 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

Course Outcomes

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

Modules

Credits: 5 **Total contact hours: 75 (Including assignments and tests)**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Bonding in Solids**					
	1	Types of bonds in crystals - Ionic, covalent, Metallic, Vander waal's and Hydrogen Bonding	3	To understand the fundamental principles of types of bonds in crystals	Lecture and Discussion	Evaluation through:

	2	Bond energy of sodium chloride molecule - variation of inter atomic force with inter atomic spacing	3	To analyze the variation of inter atomic force with inter atomic spacing	Lecture and Discussion	quiz, short questions
	3	Cohesive energy - cohesive energy of ionic solids - application to sodium chloride crystal	3	To understand the cohesive energy	Lecture Discussion and Problem Solving	Formative assessment
	4	Evaluation of Madelung constant for sodium chloride	3	To derive the Madelung constant for sodium chloride	Discussion and lecture	
II	**Crystal Structure and Crystal Diffraction**					
	1	Crystal Lattice -Primitive and unit cell-seven classes of crystal-Bravais Lattice- Miller Indices	3	To understand the seven classes of crystal	Demonstration and lecture	Evaluation through: quiz, Multiple choice, questions, Formative assessment
	2	Crystal Diffraction – Bragg's Law	3	To apply the Bragg's Law	demonstration and lecture –cum-discussion, Problem Solving	
	3	Experimental methods-Laue method, powder method and rotating crystal method	3	To understand the experimental methods	Lecture-cum-Discussion and Demonstration	
	4	Reciprocal lattice- Intensity and structure factor.	3	To analyze the reciprocal lattice	Lecture-cum-discussion	
III	**Magnetic Properties**					
	1	Spontaneous Magnetization – Weiss Theory – Temperature dependence of Magnetization	3	To understand the Weiss Theory of Magnetization	Lecture-cum-discussion, Problem solving	Evaluation through: quiz, Assignments Multiple
	2	Classical Theory of Diamagnetism	3	To discuss the classical Theory of Diamagnetism	Lecture discussion, Problem	

					solving	choice questions Descriptive answers Formative assessment
	3	Weiss theory of Para magnetism – Ferromagnetic domains – Bloch wall	3	To understand the basics of Ferromagnetic domains	Demonstration, Lecture-cum-discussion	
	4	Basic ideas of anti- ferromagnetism – Ferri magnetisms – Ferrites in computer Memories.	3	To discuss about the ferrites and its applications	Demonstration, Lecture-cum-discussion	
IV	**Dielectric Properties**					
	1	Band theory of solids – classification of insulators, Semiconductors, conductors	3	To understand the band theory of solids	Lecture-cum-discussion	Evaluation through: quiz Assignments Short questions Descriptive answers Formative assessment
	2	Intrinsic and extrinsic semiconductor	3	To understand and derive the Intrinsic and extrinsic semiconductor	Lecture, Demonstration, Group discussion	
	3	Carrier concentration for electron - Barrier Potential Calculation	2	To understand the carrier concentration for electron	Lecture-cum-discussion	
	4	Rectifier Equation Dielectrics - Polarization – frequency and temperature effects on polarization	2	To discuss about the Accelerators	Lecture-cum-discussion	
	5	Dielectric loss-Clausius Mosotti relation- determination of dielectric constants.	2	The understand about the principles of betatron and synchrotrons	Lecture-cum-discussion	
V	**SuperConductivity**					
	1	Introduction - General Properties of Superconductors - effect of magnetic field	3	To understand the basic concepts of Superconductors	Lecture-cum-discussion, Demonstration	Evaluation through: quiz, Assignments Formative assessment
	2	Meissner effect-effect of current- thermal properties- entropy-specific heat -energy gap - isotope effect	3	To discuss Meissner effect	Lecture-cum-discussion, Demonstration	
	3	London equations - AC & DC Josephson effects -	3	To understand the London equations	Lecture-cum-discussion,	

		applications-			Demonstration	
	4	Type–I and Type–II Superconductors - Explanation for the Occurrence of Super Conductivity - BCS theory - Application of Superconductors - High T_C superconductors.	3	To discuss the Type–I and Type–II Superconductors and application of Superconductors	Lecture-cum-discussion, Demonstration	

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

Course Instructors: Dr. C.Nirmala Louis & Dr. V.Shally

Holy Cross College (Autonomous), Nagercoil-629004
B.Sc. Physics

Semester :VI

Name of the Course: Relativity and Quantum Mechanics : Major Core –VIII

Subject Code : PC2061

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objective

1. To acquire sufficient knowledge in the concept of Relativity, dual nature of matter waves,
2. To apply the Quantum mechanics principles, Operator formalisms and derive Schrodinger equation and its applications.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	gain knowledge in the concepts of special and theory of relativity	PSO - 1	**U**
CO - 2	evolve ideas about dual nature of matter	PSO - 2	**E**
CO - 3	recognize basic terms in Quantum Mechanics and different operator mechanism	PSO - 3	**C**
CO - 4	apply of Schrödinger's equation to micro system	PSO - 4	**Ap**

Teaching Plan

Total contact hours: 90 (Including lectures, assignments and Tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Relativity**:					
	1	Frames of reference - Galilean transformation.	4	Describe different frame of reference and	Lecture,discussion PPT	Multiple Choice Questions

				transform ations.		Quiz, Formative Assessment I Assignment
	2	Michelson-Morley experiment -Postulates of special theory of relativity	3	Able to explain Michelson morely experiment.	Lecture demons tration PPT	
	3	Lorentz transformation - length Contraction – time dilation - Relativity of simultaneity - addition of velocities	5	Able to apply Lorentz transormatio n in the case of length, time and velocity	Lecture demons tration PPT	
	4	Variation of mass with velocity– Mass energy relation - Elementary ideas of general relativity.	3	Able to understand general relativity.	PPT Lectur e discus sion	
II	**Wave Theory:**					
	1	Wave Nature of Matter Phase and group velocity.	3	Describe particle wave nature.	PPT Lecture discussi on	Multiple Choice Questions Quiz, Formative Assessment I
	2	Wave packet - expression of De Brogile's wave length.	4	Derive debroglie waveleng th	PPT Lecture discussi on	
	3	Davisson and Germer's experiment - G.P.Thomson's experiment.	5	Able to explain wave nature experiments.	PPT Lecture	
	4	Heisenberg's uncertainty principle and its consequences.	3	Able to describe uncertanitie s.	Lecture PPT	
III	**Fundamentals of quantum mechanics:**					
	1	Schrodinger Equation Inadequacy of classical mechanics - Basic postulates	4	Describe the postulates of quantum	Lectur e, PPT	Multiple Choice Questions

		of quantum mechanics.		mechanics.		Quiz, Formative Assessment I & II
	2	Schrodinger equation - Properties of wave function - Probability interpretation of wavefunction.	5	Derive and interpret schrodinger wave equation.	Lecture PPT	
	3	Linear operators - self adjoint operators .	3	Recognize operators	Lecture PPT	
	4	Expectation value - eigenvalues and eigenfunctions - commutativity and compatibility.	3	Able to calculate Eigen values and functions.	Lecture PPT	
IV	**Operators:**					
	1	Angular Momentum in Quantum Mechanics Orbital angular momentum operators and their commutation relations.	5	Recognize different operators and its relations	Lecture discussion, PPT	Multiple Choice Questions Quiz, Formative Assessment II
	2	Separation of three dimensional Schrodinger equation into radial and angular parts	5	Separate Schrodinger equation into radial and angular parts	Lecture discussion, PPT	
	3	Elementary ideas of spin angular momentum of an electron - Pauli matrices.	5	Understand Elementary ideas in quantum mechanics	Lecture discussion, PPT	
V	**Applications of Schrodinger Equation:**					
	1	Solutions of Schrodinger Equation – Time dependent and time independent Schrodinger equation.	5	Able to apply Schrodinger Equation in time dependent and time independent state.	Lecture discussion, PPT	Multiple Choice Questions Quiz,

	2	Free particle solution - Particle in a box - Potential well of finite depth (one dimension).	5	Able to apply Schroding er Equation in Particle in a box	Lecture discussi on, PPT	Formative Assessment II
	3	Linear harmonic oscillator - rigid rotator and hydrogen atom.	5	Able to apply harmonic oscillator.	Group discussi on, PPT	

Course Instructor: Dr. M. Abila Jeba Queen

HOLY CROSS COLLEGE (Autonomous), Nagercoil-629004

B.Sc. Physics

Semester :VI

Name of the Course: Digital and Communication Electronics: Major Core – IX

Subject Code : PC2062

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To understand the structure of various number system and basic Logic gates.
2. To design and solve the Boolean Algebra simplification and Karnaugh Maps.
3. To construct sequential circuits and to design counters.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO -1	Understand the basic operation, and features related to Logic gates and interprets their applications.	PSO-1	U
CO -2	Acquire knowledge on number system, arithmetic building blocks, and memories.	PSO-3	E
CO -3	Understand the fundamental concepts of logic gates, counters, registers, fiber optics, etc.	PSO-1	U
CO -4	Develop skill to build and troubleshoot combinational digital circuits.	PSO-7	Ap
CO-5	Understand AM, FM and PM modulation and demodulation techniques.	PSO-1	U
CO-6	Assess the basic concepts of fiber optics and types of fiber	PSO-2	E

	diodes, transistor, op-amps and converters.		
CO-7	Learn the working principle of satellite communication system.	**PSO-6**	**C**

Modules

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

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Digital Fundamentals**					
	1	Number Systems and Conversions - Binary-Coded Decimal (BCD) Code - Gray code - 1's and 2's complements	6	To understand the concept of number systems.	Lecture discussion with PPT illustration	Evaluation through short test Multiple choice questions Formative assessment I
	2	Basic logic gates - NAND, NOR and EX-OR gates - NAND and NOR as Universal Building blocks - Laws and theorems of Boolean algebra	5	To analyze the operation of basic and universal logic gates and the laws of Boolean algebra.	Lecture discussion with illustration	
	3	NAND-NAND circuits - Karnaugh's map- Sum of Product (SOP) and Product of Sum (POS) - applications	4	To evaluate the Sum of Product (SOP) and Product of Sum (POS) using Logic gates.	Lecture discussion	

II	**Sequential Logic**					
	1	RS-Flip flop, Clocked RS Flip flop, D-Flip flop, J-K and J-K Master-Slave Flip-flop	6	To identify the principle of flip flops.	Lecture discussion with PPT Illustration	Short test Quiz Assignment Formative assessment I
	2	Shift registers and Counters - Multiplexers and Demultiplexers	4	To acquire knowledge on shift registers and multiplexers.	Lecture discussion	
	3	Decoders and Encoders - Memory Circuits - D/A and A/D converters - applications	5	To categorize the applications of encoders and analog to digital converters.	Lecture Illustration	
III	**Modulation and Demodulation**					
	1	Amplitude modulation - Frequency modulation, Phase Modulation and Pulse Width Modulation -	5	To recall the concept of modulation and to recognize the different types of modulation and demodulation techniques.	Lecture with PPT Illustration	Short test Quiz Assignment Formative assessment I
	2	Detectors of Amplitude Modulation (AM), Frequency Modulation (FM)	4	To acquire knowledge on different kinds of the demodulators used in amplitude and frequency modulation.	Lecture discussion	
	3	Phase modulation (PM) and Pulse	6	To understand the concept of phase modulation	Question-answer session	

		width modulation (PWM), Phase locked loop (PLL) - Noise in Communication Systems.		and noise in AM and FM systems.	Lecture	
IV	**Digital and Satellite Communication**					
	1	Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK) Modulation and Demodulation, Advantages and disadvantages of digital communication.	3	To understand the concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK).	Lecture with PPT Illustration	Short test Quiz Assignment Formative assessment II
	2	Communication Satellite Systems - Telemetry - Tracking and Command System- Satellite Links	6	To acquire knowledge on different kinds Satellite Communicatio n Systems.	Lecture Discussion	
	3	Commonly Used frequency in Satellite Communication - Multiple access - Error Detection.	6	To understand the concept of phase modulation and noise in AM and FM	Question-answer session Lecture	

				systems.		
V	**Fibre Optic Communication**					
	1	Basic Fibre Optic System - Advantages of Fibre Optic System - Propagation of light through fibre	6	To acquire knowledge on fibre optic systems.	Lecture with PPT	Short test Quiz Assignment Formative assessment II
	2	Numerical aperture - Acceptance angle - Losses and distortion in optical fibres	5	To evaluate the parameters related to loss in optical fibres.	Brain storming session. Lecture Illustration	
	3	Basic Fibre Optical communication and links - Special applications	4	To learn the applications of optical communicatio n.	Lecture with PPT Illustration	

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

Course Instructors: Dr. R. Krishna Priya& Dr. M. Priya Dharshini

HOLY CROSS COLLEGE (Autonomous), Nagercoil-629004

B.Sc. Physics

Semester: VI
Course Name: Nuclear Physics
Course code: PC2063

Hours/Week	Credits	Total hours	Marks
5	5	75	100

Learning Objectives

1. To acquire knowledge on static properties of nuclei and its stability.
2. To understand the background of various nuclear models.
3. To know about different modes of decay and interaction of nuclear radiations with matter

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO 1	understanding on the basics of nuclear physics that treats atomic nuclei as self-bound many-body quantum systems	**PSO-1**	**U**
CO2	knowledge about particle- antiparticle, decay processes and their outcomes.	**PSO-2**	**U**
CO 3	basic interaction between fundamental particles.	**PSO-4**	**An**

Modules

Credits: 5 **Total contact hours: 75 (Including assignments and tests)**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Properties and structure of Nuclei**					
	1	General properties of nucleus- binding energy – BE/A curve - significance	3	To apply the binding energy per nucleon curve in the calculation of energy.	Lecture Discussion and Problem Solving	Evaluation through: quiz, short questions

	2	proton electron theory- proton neutron theory	3	To understand the fundamental principles of proton electron theory .	Lecture Discussion and Problem Solving	Formative assessment
	3	nuclear forces –characteristics – Meson theory of nuclear forces	3	To understand the various nuclear forces To study Meson theory of nuclear forces	Lecture Discussion and Problem Solving	
	4	Yukava Potential- Nuclear models.	3	To understand the principle and working of Nuclear models.	Discussion and lecture	
II	**Radio Activity**					
	1	Fundamental laws of radio activity –theory of α ,β and ϒ decay	3	To understand the different modes of radio activity	Demonstration and lecture	Evaluation through: quiz, Multiple choice, questions, Formative assessment
	2	properties of alpha, beta and gamma rays	3	To apply the properties of alpha, beta and gamma rays in reactors	demonstration and lecture – cum-discussion, Problem Solving	
	3	neutrino and its properties- electron capture	2	To understand neutrino and its properties	Lecture-cum-Discussion and Demonstration	
	4	nuclear isomers- Mossabauer effect - applications	2	To understand the principles and working of Mossabauer spectroscopy	Lecture- cum-discussion	
	5	Radio carbon dating- radio isotopes – uses.	2	To compare radio isotopes and its uses.	Group Discussion and lecture	
III	**Nuclear Reactions**					
	1	Kinematics of nuclear reaction- nuclear fission –Nuclear fusion	3	To understand about nuclear fission and Nuclear fusion	Lecture-cum-discussion, Problem solving	Evaluation through: quiz, Assignments

	2	Nuclear reactor-uses - atom bomb	3	To discuss about Nuclear reactor and its uses	Lecture discussion, Problem solving	Multiple choice questions Descriptive answers Formative assessment
	3	hydrogen bomb-fusion reactor – plasma confinement	3	To discuss about hydrogen bomb and fusion reactor	Demonstration, Lecture-cum-discussion	
	4	Artificial transmutation-Q value of nuclear reaction-types of nuclear reaction	3	To discuss about types of nuclear reaction	Demonstration, Lecture-cum-discussion	
IV	**Nuclear Detectors and Particle Accelerators**					
	1	Neutron sources and properties	3	To understand about Neutron sources and properties	Lecture-cum-discussion	Evaluation through: quiz Assignments Short questions Descriptive answers Formative assessment
	2	Detectors-G.M.Counter-scintillation counter	3	To construct Detectors like G.M.Counter and scintillation counter	Lecture, Demonstration, Group discussion	
	3	bubble chamber-Wilson cloud chamber	2	To understand about bubble chamber and Wilson cloud chamber	Lecture-cum-discussion	
	4	Accelerators-cyclotron-synchrocyclotron	2	To discuss about the Accelerators	Lecture-cum-discussion	
	5	betatron-synchrotrons	2	The understand about the principles of betatron and synchrotrons	Lecture-cum-discussion	
V	**Cosmic Rays and Elementary Particles**					
	1	Cosmic rays-introduction-discovery-latitude, altitude and azimuth effects- longitudinal effect-north –south effect	3	To understand the basic concepts of Cosmic rays	Lecture-cum-discussion, Demonstration	Evaluation through: quiz, Assignments on operational amplifier problems Formative
	2	seasonal and diurnal changes-primary and secondary cosmic rays-nature of cosmic rays-cosmic ray showers Van Allen belt- origin of cosmic radiation.	3	To discuss primary and secondary cosmic rays	Lecture-cum-discussion, Demonstration	
	3	Elementary particles-	3	To understand	Lecture-cum-	

		introduction-particles and antiparticles-antimatter-the fundamental interaction		Elementary particles	discussion, Demonstration	assessment
	4	elementary particle quantum numbers-conservation laws and symmetry-the quark model	3	To construct the quark model	Lecture-cum-discussion, Demonstration	

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

Course Instructors: Dr. C.Nirmala Louis & Dr. V.Shally

HOLY CROSS COLLEGE (Autonomous), Nagercoil-629004

B.Sc. Physics

Semester: VI

Name of the Course: Nanophysics: Elective- III (b)

Subject Code : PC2065

Hours /Week	Credits	Total hours	Marks
5	4	75	100

Learning Objectives

1. To gain knowledge on synthesis and characterization of nanomaterials.
2. To understand the advancements and applications of nanostructures.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	infer the history of nanotechnology and explain the synthesis of nanomaterials.	**PSO - 1**	**U**
CO - 2	interpret quantum well, quantum wires and quantum dots.	**PSO - 5**	**E**
CO - 3	explain the carbon nanotubes and its applications.	**PSO - 6**	**E**
CO - 4	discuss the applications of nanotechnology in various fields.	**PSO - 4**	**C**

Modules

Total contact hours: 90 (Including lectures, assignment and tests)

Unit	Section	Topics	Lecture Hours	Learning outcomes	Pedagogy	Assessment/Evaluation
I	**Nanomaterials**					
	1	History of Nanotechnology - Background -	3	To understand the	Lecture Discussion with PPT	

		Conceptual origins - Experimental advances - Nanostructures		background and importance of nano	Illustration	
	2	Nanomaterials - Synthesis of oxide nanoparticles- Sol-gel processing - Synthesis of semiconductor nanoparticles	3	To be able to differentiate the synthesis methods in nanomaterial preparation	Lecture discussion	Evaluation through: Online quiz, Formative assessment I
	3	Arrested precipitation - Synthesis of metallic nanoparticles	3	To be able to understand the synthesis of metallic nanoparticles	PPT Illustration	
	4	Sonochemical reduction process - Electrochemical deposition method - Biosynthesis of nanoparticles	3	To learn about the chemical and bio synthesis of nanoparticles	Lecture discussion	
II	**Quantum Hetero structure**					
	1	Super lattice - Preparation of Quantum nanostructure - Quantum well lasers	3	To understand the concept quantum well	PPT and group Discussion	Evaluation through: Online quiz, Short questions Descriptive answers Formative assessment I
	2	Quantum cascade laser - Application - Quantum wire - production of nanowires	3	To be able to synthesize nanowires	Lecture Discussion with PPT Illustration	
	3	Structure of nanowires - Use of nanowires -	3	To able to learn the applicatio	PPT Illustration	

		Quantum dot - Application of Quantum dots		ns of quantum dots		
	4	Quantum dot information storage - Quantum dot infrared photo detectors - Quantum dot lasers	3	To know the various applications of quantum dots	Lecture Discussion with PPT Illustration	
III	**Carbon Nanotubes**					
	1	Discovery of Nanotubes - Carbon Allotropes - Diamond - Graphite - Carbon Nanotubes	3	To understand the CNTs and its types	Lecture discussion	Evaluation Evaluation through: Online quiz, Short questions Descriptive answers Formative assessment I/II
	2	Types of carbon Nanotubes- Single walled carbon nanotubes - Multiwalled carbon nanotube - Fullerite - Torus - Nanobuds	3	To be able to distinguish different types of CNTs	Lecture Discussion with PPT Illustration	
	3	Graphene sheet to a single walled nanotube - Electronic structure of Carbon Nanotubes	3	To be able to study the structure of CNTs	Lecture discussion	
	4	Synthesis of Carbon Nanotube - Electric Arc Discharge method - Laser method.	3	To understand the different synthesis methods in CNT production	PPT and group Discussion	
IV	**Magneto Electronics**					
	1	Nanocrystalline soft material - Permanent magnet material	3	To understand the fundamentals of	Lecture Discussion with PPT Illustratio	Evaluation through: Online quiz, Problem solving short questions Descriptive

				magnetic nanomaterials	n	answers Formative assessment II
	2	Theoretical background - Super paramagnetism - Coulomb blockade	3	To understand the principle behind the superpara magnetism	Lecture discussion	
	3	Quantum cellular Automata- Spintronics	3	To be able to mention the importance of nanomechanics	PPT Illustration	
	4	Giant magneto resistance (GMR) - Types of GMR.	3	To understand the concept giant magnetoresistance	Lecture Discussion with PPT Illustration	
V	**Application of Nanotechnology**					
	1	Chemistry and Environment - Energy applications of nanotechnology	3	To be able to analyze the environmental problems and find the solutions using nanotechnology	PPT Illustration	Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment II
	2	Information and Communication - Heavy Industry – Consumer goods	3	To be able to apply nanotechnology in communication	Lecture Discussion with PPT Illustration	
	3	Nanomedicine - Medical application of	3	To learn the applicatio	Lecture discussion	

		Nanotechnology - Biomarkers and Bioimaging		ns of nanopartic les in Medicine		
	4	Targeted drug delivery - Nanorobots.	3	To learn the applicatio ns of nanopartic les in medical field	PPT Illustratio n	

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

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