Teaching Plan (2019-2020)
Semester : V

Name of the Course : Elements of Modern Physics

Subject code : PC1751

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

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

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

Unit	Module	Description	Lecture hours	Learning outcome	Pagagogy	Assessment /Evaluation
I	**Particle Nature of Radiation**					
	1	Introduction , Spectral distribution of blackbody radiation, Quantum hypothesis of Planck	2	To summarise the quantum theories	PPT, Lecture method	Quiz test, Formative assessment (I)
	2.	Planck's law of radiation, Photoelectric Effect, Photoemission characteristics Failure of electromagnetic wave theory, Einstein's	5	To explain particle nature	PPT,	

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

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

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

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

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Waves and Optics

Subject code : PC1752

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

Objectives 1. To study the electromagnetic nature of light.

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

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

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

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

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

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

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

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

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Solid State Physics

Subject code : PC1753

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

Objectives

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

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

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

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

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

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

Course Instructor : Dr. C. Nirmala Louis

Head of the Department : Dr. S. Mary Delphine

Name of the Course : Programming with C++

Subject code : PC1754

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

Objectives:

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

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

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

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

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

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

Head of the Department : Dr. S. Mary Delphine