GOVERNMENT GENERAL DEGREE COLLEGE SINGUR

DEPARTMENT OF PHYSICS

Name of The Programme	Year of introduction	Sem	Course	Course Name	Program Specific Outcome	Course Outcome
B.Sc. Physics (Hons.) under CBCS	2017-2018	I	CC-I Theory	Mathematical Physics- I	This course recapitulates few preliminary aspects of calculus such as differentiation, integration, differential equations, curve-plotting techniques along with their applications necessary for beginning of study of physics at the undergraduate-level. Moreover vector calculus and the orthogonal curvilinear coordinates are extensively taught in this course. The theory of probability and Dirac Delta function are also introduce here to have the students acquainted with a strong mathematical back ground necessary for the study of physics at the undergraduate level.	T1.1 This parts introduces various preliminary and advanced aspects of calculus. T1.2 This part of the course discusses vector calculus. T1.3 This portion orthogonal curvilinear coordinates. T1.4 The theory of probability is introduced here. T1.6 This part introduces Dirac Delta function and its properties.
			CC-I Practical	Mathematical Physics- I Lab	This course the designed to make the students familiar with the Computer programming in C/ C++ and its application in numerical analysis to solve various problems in physics. This lab helps the students to have an idea about solving the problems numerically those cannot be solved analytically using the mathematical tools they	P1.1 This part introduces an overview of computer architecture and organization, memory and input/output devices. P1.2 This part introduces basics of scientific computing such as binary and decimal arithmetic, floating point numbers, iterative methods etc. P1.3 This part introduces the theory of error and error analysis.

					have been introduced in CC-I theory course.	P1.4 This part basically reviews C programming fundamentals. P1.5 This part introduces random number generations and its application for finding area of circle, area of square, volume of sphere, values of pi. P1.6 This part introduces solution of algebraic and transcendental equations by bisection, Newton Raphson and Secant methods. P1.7 This part introduces Interpolation by Newton Gregory Forward and Backward difference formula, error estimation of linear interpolation. P1.8 This part introduces Numerical differentiation and integration, Mone carlo method. P1.9 This part introduces solution of ordinary differential equations by Euler, modified Euler, Runge-Kutta second and fourth order methods etc.
			CC-II Theory	Mechanics	This mechanics course starts with the preliminary theories of classical mechanics. The course is structured in such a way that the students get acquainted with the basics of classical mechanics extensively. The topics such as Fundamental of Dynamics, Work and Energy, Rotational dynamics, Elasticity, Fluid motion, Oscillations, Motion under central force, Non-Inertial systems and Special theory of relativity are introduced here to make the	T2.1 This part introduces fundamentals of dynamics. T2.2 This part discusses the work and energy. T2.3 This part introduces the collisions. T2.4 This part of the course deals with rotational dynamics. T2.5 This part deals with the theory of Elasticity. T2.6 This part of the course deals with the fluid motion. T2.7 This portion discusses the motion of a particle under a central force field.

					students familiar with the classical mechanics which would help them in future to study the advanced classical mechanics.	T2.8 Here the theory of oscillations are mainly discussed. T2.9 This part discusses Non-inertial systems. T2.10 This part of the course discusses the special theory of relativity.
			CC-II Practical	Mechanics Lab	The practical course helps to teach the students the measurement techniques using different measuring instruments such as vernier caliper, screw gauge and traveling microscope along with the error analysis procedure in the different measurement techniques. Moreover in the laboratory various physical quantities like moment of inertia, gravitational acceleration, coefficient of viscosity, Young's modulus, modulus of rigidity, elastic constants are measured to make the students familiar with measurement techniques using the theoretical background of the experiment. This will help the students to get trained so that they can perform new experiments on their own in future.	P2.1 This part demonstrate the measurements of length using vernier caliper, screw gauge and travelling microscope etc. P2.2 This part introduces the study of random errors in different observations. P2.3 This part introduces the measurement of spring constant and gravitational acceleration and modulus of rigidity. P2.4 This practical deals with the determination of moment of inertial of a regular shaped body. P2.5 This part determines the gravitational constant g and velocity for a freely falling body using digital time technique. P2.6 This practical determines the coefficient of viscosity of water by capillary flow method (Poiseuille's method). P2.7 This practical determines the Young's Modulus of a wire by optical lever method. P2.8 This practical determines the coefficient of viscosity of highly viscous liquid by Stokes method. P2.9 This part determines the modulus of rigidity of a wire by dynamical method.

						P2.10 This practical determines the elastic constant of a wire by Seale's method. P2.11 This part determines the value of gravitational constant using a Kater's pendulum. P2.12 This part determines the value of Young's modulus by Flexure method.
		II	CC- III Theory	Electricity and Magnetism	Different principles, laws and properties of electric and magnetic fields along with electromagnetic induction are taught in this course. This course helps the students to understand the fundamentals of the electrostatics, magnetostatics, electric fields, magnetic fields and their inter-relation along with the current electricity and network theorems.	T3.1 This part discusses the preliminary theory of electrostatic fields, Gauss law and its applications. T3.2 This part deals with the conservative nature of the electrostatic field. T3.3 This part introduces electrostatic energy of system of charges. T3.4 This part introduces the Dielectric properties of matter. T3.5 This part introduces the magnetic field. T3.6 This part introduces the magnetic properties of matter. T3.7 This portion introduces the electromagnetic induction. T3.8 This part introduces the electrical circuits. T3.9 This part deals with the network theorems. T3.10 This part deals with the theory of ballistic galvanometer.
			CC- III Practical	Electricity and Magnetism Lab	The practical classes in this course helps the students to work with the electrical instruments and have better ideas about the troubleshoot in handling the electrical instruments.	P3.1 This part deals with the use of a Multimeter for measuring different electrical circuit components like (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses etc. P3.2 This is meant to study the

						characteristics of a series RC Circuit. P3.3 This practical teaches how to determine an unknown Low Resistance using Potentiometer. P3.4 This practical determines an unknown Low Resistance using Carey Foster‟s Bridge. P3.5 To compare capacitances using De'Sauty's bridge is performed in this practical. P3.6 This practical aims to measure the field strength B and its variation with distance using search coil. P3.7 This practical is performed to verify the Thevenin and Norton theorems. P3.8 This practical is meant for verifying the Superposition, and Maximum power transfer theorems. P3.9 This practical is performed to determine self inductance of a coil by Anderson‟s bridge. P3.10 This practical teaches to study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. P3.11 To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q is performed in the practical. P3.12 The practical deals with the measurement of charge and current sensitivity and CDR of

						Ballistic Galvanometer. P3.13 The practical determines a high resistance by leakage method using Ballistic Galvanometer. P3.14 This is to determine the mutual inductance of two coils by Carey-Foster‟s method. P3.15 This practical teaches the Construction of one ohm coil.
			CC- IV Theory	Waves and Optics	In this course starts with teaching the fundamentals of waves, wave motion and their superposition. The students get to learn how to analyse the resultant motion of a particle when two or more waves are incident on it. The students also learn about the electromagnetic waves and their superposition. This is known as the wave optics.	T4.1 This part aims to teach superposition of collinear harmonic oscillations with equal and different frequencies. T4.2 This part of the course teaches superposition of two perpendicular harmonic oscillations with equal and unequal frequencies. T4.3 This part deals with teaching wave motion. T4.4 This unit aims to teach velocity of waves. T4.5 This part deals with the superposition of two harmonic waves. T4.6 This part is meant to teach wave optics. T4.7 This part teaches the Interference phenomenon associated with wave optics. T4.8 This part discusses about different Interferometers. T4.9 This part teaches the Diffraction phenomenon associated with wave optics. T4.10 This part discusses about Fraunhofer diffraction. T4.11 This part aims to study Fresnel Diffraction. T4.12 This part discusses about

						the principle of Holography and its applications.
			CC- IV Practical	Waves and Optics Lab	This laboratory helps the students to learn how to handle the delicate optical instruments and work with them. This will help the students in better understanding of the theories they learn in the theory course.	P4.1 This practical aims to investigate the motion of coupled oscillators. P4.2 This practical aims to study Lissajous Figures. P4.3 This practical deals with familiarization with Schuster`s focusing and determination of angle of prism. P 4.4 This practical is performed to determine refractive index of the Material of a prism using sodium source. P4.5 To determine the dispersive power and Cauchy constants of the material of a prism using mercury source is the purpose of this practical. P4.6 This practical teaches to determine wavelength of sodium light using Fresnel Bi-prism. P4.7 This practical aims to determine wavelength of sodium light using Newton's Rings. P4.8 This practical aims to determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film. P4.9 This practical is performed to determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating. P4.10 This practical aims to determine dispersive power

						and resolving power of a plane diffraction grating.
		III	CC- V Theory	Mathematical Physics-II	In this course the students are taught the some of the mathematical tools extremely necessary for their higher studies. They get to learn about the Fourier series and its applications, solving differential equations by Frobenius method, solving partial differential equations and some special integrals like beta and gamma functions, error functions etc. They also get some ideas about the statistics and its application in terms of the theory of errors in this course.	T5.1 The Fourier series and its various applications are introduced in this unit. T5.2 This unit introduces to the students the Frobenius method functions for solving differential equations and special functions such as Legendre polynomials, Bessel functions etc. T5.3 In this unit some special integrals such as Beta and Gamma functions and relation between them are introduced. T5.4 The theory of errors is introduced here. T5.5 The theory of partial differential equations and its applications in different physical systems are introduced in this unit.
			CC- V Practical	Mathematical Physics-II Lab	This course introduces to the students a numerical computation software Scilab. The students learn the basics of working with Scilab software and they also solve different numerical problems with this Scilab software.	P 5.1The numerical computation software Scilab is introduced to the students in this unit. P5.2 Various numerical techniques such as the curve fitting, least square fit, goodness of fit, standard deviation etc. are introduced to the students. P5.3 Solution of linear system of equations by Gauss elimination method and Gauss Seidal method, diagonalization of matrices, inverse of a matrix, eigen vectors, eigen values problems are introduced in this unit. P5.4 Generating and plotting of Legendre polynomials and Bessel functions are performed in this unit. P5.5 Solutions of first order, second order ordinary

						differential equations and partial differential equations are performed in this unit. P5.6 In this unit the use of Scicos/ xcos for generating square wave, sine wave, saw tooth wave, solving harmonic oscillator, studying of beat phenomenon, phase space plots is introduced.
			CC- VI Theory	Thermal Physics	In this course the kinetic theory of gases and the thermodynamics are introduced to the students. The students learn how the velocities are distributed over a large number of gas molecules and its macroscopic behavior. Along with the ideal gases they study about the behavior of real gases. The students also learn about the laws of thermodynamics, concept of entropy, thermodynamic potentials and their relations.	T6.1 In this unit the Zeroth and First law of thermodynamics, thermodynamic variables and the applications are introduced. T6.2 Second law of thermodynamics is introduced here along with applications. T6.3 Concept of entropy is introduced here. Various examples are discussed as the calculation of entropy for different systems. T6.4 Thermodynamic potentials are introduced here. T6.5 Maxwell's thermodynamic relations are discussed here along with their applications. T6.6 Kinetic theory of gases is introduced here. Distribution of velocities, molecular collisions are extensively discussed. T6.7 The theory of real gases is introduced in details here.
			CC- VI Practical	Thermal Physics Lab	In this laboratory the students perform various measurements to determine different thermal properties of matter in terms of Stefan's constant, Coefficient of thermal conductivity , temperature coefficient of resistance and the variation of thermo-emf with temperature etc.	P6.1 This practical is performed to determine Stefan's constant. P6.2 This practical is to determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus. P6.3 This practical determines the Coefficient of Thermal Conductivity of a bad conductor by Lee and

						Charlton's disc method. P6.4 This practical is performed to determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT) and determine the boiling point of a liquid. P6.5 This practical studies the variation of Thermo-emf of a Thermocouple with Difference of Temperature of its Two Junctions. P6.6 This practical is performed to calibrate a thermocouple to measure temperature in a specified Range using (i) Null Method, (ii) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.
			CC- VII Theory	Digital Systems and Applications	In this course the Boolean algebra and digital electronics and the applications are taught to the students. The students learn about the integrated circuits, digital circuits, arithmetic circuits, shift registers, 4 bits counters, computer organization, Intel 8085 microprocessor. Also the assembly language is introduced in this course. This course as a whole provides the students with a vast knowledge on digital electronics.	T7.1 This unit introduces the construction and uses of a CRO. T7.2 This unit qualitatively introduces the integrated circuits. T7.3 This unit introduces binary numbers, octal and hexadecimal numbers, logic gates and their applications. T7.4 This unit introduces Boolean algebra. T7.5 This unit introduces Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders etc. T7.6 This unit introduces the Arithmetic Circuits such as Binary Addition, Binary Subtraction using 2's Complement, Half and Full Adders, Half & Full Subtractors, 4-bit binary Adder/Subtractor etc.\

						T7.7 Here the Sequential Circuits are introduced as SR, D, and JK Flip-Flops, Clocked (Level and Edge Triggered) Flip-Flops, Preset and Clear operations, Race-around conditions in JK Flip-Flop, M/S JK Flip-Flop etc. T7.8 Here the IC 555 and its applications in astable multivibrator and monostable multivibrator are introduced. T7.9 Here the Shift registers are introduced. T7.10 Here 4 bits Counters are introduced. T7.11 Here the Computer Organization is discussed. T7.12 Here the Intel 8085 Microprocessor is discussed in details. T7.13 Here Assembly Language is introduced.
			CC- VII Practical	Digital Systems and Applications Lab	This course helps the students to design various digital circuits with fundamental logic gates. The students also learn about how to programs using 8085 microprocessor.	P7.1 This practical is to measure (a) Voltage, and (b) Time period of a periodic waveform using CRO. P7.2 This practical is performed to test a Diode and Transistor using a Multimeter. P7.3 This practical designs a switch (NOT gate) using a transistor. P7.4 This practical is performed to verify and design AND, OR, NOT and XOR gates using NAND gates. P7.5 This practical is to design a combinational logic system for a specified Truth Table. P7.6 This practical is performed to convert a Boolean expression into logic circuit

						and design it using logic gate ICs. P7.7 This practical is performed to minimize a given logic circuit. P7.8 This practical studies Half Adder, Full Adder and 4-bit binary Adder. P7.9 This practical studies Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder I.C. P7.10 This practical is performed to build JK Master-slave flip-flop using Flip-Flop ICs. P7.11 This practical is performed to design an astable multivibrator of given specifications using 555 Timer. P7.12 This practicval is performed to design a monostable multivibrator of given specifications using 555 Timer. P7.13 This practical teaches how towrite the following programs using 8085 Microprocessor a) Addition and subtraction of numbers using direct addressing mode b) Addition and subtraction of numbers using indirect addressing mode c) Multiplication by repeated addition. d) Division by repeated subtraction.
			SEC-1	Renewable energy and energy harvesting	In this course, the students learn about the alternative sources of energy such as renewable and non-conventional sources apart from fossil fuels and nuclear energy. They learn about solar	TS1. In this unit the study of Fossil fuels and Alternate Sources of energy is introduced. TS2. Solar energy is introduced in this unit. TS3. This unit discusses the

					energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass, biochemical conversion, biogas generation, geothermal energy, hydroelectricity etc.	Wind Energy harvesting. TS4. This unit studies the Ocean Energy. TS5. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass are studied in this unit. TS6. Geothermal Energy is discussed here. TS7. Piezoelectric Energy harvesting is introduced in this unit. TS8. This unit discusses Electromagnetic Energy Harvesting. TS9. Carbon captured technologies, cell, batteries, power consumption are discussed here. TS10. Here Environmental issues and Renewable sources of energy, sustainability are discussed.
		IV	CC-VIII Theory	MATHEMATICAL PHYSICS-III	In this course the students have the opportunity to learn complex analysis, Fourier Transforms and Laplace Transforms in a detailed manner. The aptitude for solving problems is also developed in course in a great detail. This course not only serves the purpose for bachelor's degree but also needed for higher studies including their research carrier.	T7.1 Here the Complex Analysis is introduced. T7.2 In this unit the Fourier Transforms is discussed in details. T7.3 In this unit the Laplace Transforms is introduced.
			CC-VIII Practical	MATHEMATICAL PHYSICS-III Lab	This course offers to the students the opportunity to improvise their knowledge on Scilab/C++ taught in	P7.1 In this unit, few particular types of differential equations are solved in Scilab. P7.2 In this practical an

					semester – 1 and 3 in terms of solving more advanced problems in mathematical physics taught in the CC-VIII theory course. This course develops in the students the aptitude for writing numerical codes in languages like Scilab/C++ and running those codes to solve and have a good insight of the problems. Moreover this course gives them an exposure for the higher studies as the advanced topics for research in physics at present require a lot of knowledge on computer programming.	integral related to Dirac Delta Function is evaluated. P7.3 In this practical evaluation of Fourier coefficients of a given periodic function (square wave) is done. P7.4 In this practical Legendre, Bessel functions are plotted along with verification of recursion relations and orthogonality checking of Legendre polynomials are done. P7.5 Numerical analyses of errors for data points recorded in previous two experiments are done in this experiments. P7.6 Least square fitting of data is performed. P7.7 Evaluation of trigonometric functions e.g. sin θ is performed here. Bessel's function at N points is evaluated and its value is evaluated at an intermediate point. Integration of the $1/(x^2+2)$ is evaluated numerically. P7.8 Computation of nth root of unity is done here. P7.9 Square roots of complex numbers are computed here. P7.10 Fourier transform is numerically done here. P7.11 Kirchoff's Current law for any arbitrary circuit using Laplace's transform is evaluated. P7.12 Kirchoff's Voltage law for any arbitrary circuit using Laplace'stransform is

						evaluated numerically. P7.13 Circuit analysis of a general LCR circuit using Laplace's transform is performed here.
			CC- IX Theory	ELEMENTS OF MODERN PHYSICS	The foundation of Quantum mechanics along with Nuclear Physics and Lasers are introduced in this course. This course helps the students to understand the physics at atomic or nuclear level and also makes them realise how the classical physics gets modified at the length scale of nm or fm ranges. The students willing on further studies of nanoscience will be greatly benefited by this course in future.	T9.1 Fundamentals of quantum physics is introduced here. T9.2 Heisenberg uncertainty principle is introduced and its applications are discussed. T9.3 Schrodinger equation for non-relativistic particles is introduced here. Momentum and Energy operators and stationary states are discussed. Physical interpretation of a wave functions, probabilities and normalization and Probability and probability current densities in one dimension are also introduced. T9.4 Energy eigenvalues and normalized eigenfunctions are evaluated for one dimensional infinitely rigid box. T9.5 Fundamentals of atomic nucleus and nuclear models are discussed. T9.6 Fundamentals of Radioactivity is introduced here. T9.7 Nuclear Fission and fusion are discussed here. T9.8 Fundamentals of Laser physics is introduced here.
			CC- IX Practical	ELEMENTS OF MODERN PHYSICS Lab	This course helps the students to learn the techniques to investigate the atomic regions with simple instruments in the laboratory. This will develop the skill in the students to perform sophisticated experiments on atomic	P9.1 Photo-electric effect is studied here. P9.2 This practical is performed to determine work function of material of filament of directly heated vacuum diode. P9.3

					or nuclear physics or in the nanoscience in future.	This practical is performed to determine the Planck"s constant using LEDs of at least 4 different colours. P9.4 This practical is performed to determine the wavelength of H-alpha emission line of Hydrogen atom. P9.5 This practical is performed to determine the excitation potential of mercury/Argon by Franck-Hertz experiment. P9.6 This practical is performed to determine the absorption lines in the rotational spectrum of Iodine vapour. P9.7 This practical is performed to determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet. P9.8 This practical is performed to setup the Millikan oil drop apparatus and determine the charge of an electron. P9.9 This practical is performed to show the tunnelling effect in tunnel diode using I-V characteristics. P9.10 This practical is performed to determine the wavelength of laser source using diffraction of single slit.
			CC- X Theory	ANALOG SYSTEMS AND APPLICATIONS	The theory of semiconductors and their applications are introduced in this course. The students are taught the physics of semiconductors and their applications in developing components in electronics such as diodes, transistors. The applications of those components in building	T10.1 Theory of Semiconductor Diodes is introduced T10.2 Two-terminal Devices and their Applications are introduced. T10.3 Theory of Bipolar Junction transistors is introduced. T10.4 Fundamentals of

					electronic circuits, integrated circuits are also the part of this course.	Amplifiers are introduced. T10.5 Theory of coupled amplifiers are introduced here. T10.6 Feedback in amplifiers is discussed. T10.7 Theory of sinusoidal oscillators are discussed. T10.8 Operational amplifier is introduced here. T10.9 Applications of Op-Amps are discussed here. T10.10 Resistive network (Weighted and R-2R Ladder), Accuracy and Resolution, A/D Conversion (successive approximation) etc. are discussed.
			CC- X Practical	ANALOG SYSTEMS AND APPLICATIONS	This practical course helps the students in building different electronic circuits and study their characteristics in the laboratory. This course also helps the students to have the ideas about the troubleshoots they can encounter in the practical situations with the different electronics circuits. This will help them to analyse the faulty circuits and find the defective components in any electronic device.	P10.1 This practical is performed to study V-I characteristics of PN junction diode, and Light emitting diode. P10.2 This practical is performed to study the V-I characteristics of a Zener diode and its use as voltage regulator. P10.3 This practical is performed to study of V-I & power curves of solar cells, and find maximum power point & efficiency. P10.4 This practical is performed to study the characteristics of a Bipolar Junction Transistor in CE configuration. P10.5 This practical is performed to study the frequency response of voltage gain of a RC-coupled transistor amplifier. P10.6 This practical is performed to study a Wien bridge oscillator for given frequency using an op-amp.

						P10.7 This practical is performed to design an inverting / non-inverting amplifier using Op-amp (741) for dc voltage of given gain. P10.8 This practical is performed to add two dc voltages using Op-amp in inverting and non-inverting mode. P10.9 This practical is performed to investigate the use of an op-amp as an Integrator / Differentiator.
			SEC- 2	ELECTRICAL CIRCUITS AND NETWORK SKILLS	The students learn about principles of basic electricity and different electrical circuits, electrical drawing, electrical symbols along with different electrical instruments such as generators, transformers, motors etc. in this course. In addition to this, the electrical wiring and protection in household are also taught in a great detail. Thus the students gets a good exposure on electrical designing of different devices and the trouble shoots in the electrical circuits, networks and appliances in household devices.	TS2.1. Basic Electricity Principles are introduced here. TS2.2. Fundamentals of Electrical Circuits are introduced in this unit. TS2.3. Electrical drawing and and symbols are introduced here. TS2.4. Generators and transformers are taught in this unit. TS2.5. Electric motors are introduced here. TS2.6. Solid state devices are introduced here. TS2.7. Electrical protections are discussed in this unit. TS2.8. Electrical wiring is introduced in this unit.
		V	CC – XI Theory	QUANTUM MECHANICS AND APPLICATIONS	The formalism of quantum mechanics is introduced in the syllabus through this course. Several problems are solved and discussed	T11.1 Time dependent Schrodinger equation and the applications are introduced here. T11.2 Time independent Schrodinger equation is taught

					in a great detail here. The students thoroughly learns the applications of quantum mechanics in the atomic and sub-atomic region in this course. This course also helps the students to understand analytically the limitations of classical theory and superiority of quantum theory in the atomic or sub-atomic region.	in this unit T11.3 General discussions on bound states for arbitrary potentials are introduced here. T11.4 Qunatum theory of hydrogen-like atoms is introduced here. T11.5 Effects of electric and magnetic fields on atoms are discussed here. T11.6 Many electron atomic systems are theoretically analysed here.
			CC – XI Practical	QUANTUM MECHANICS AND APPLICATIONS Lab	A large number of problems in quantum mechanics are not analytically solvable. This practical course helps the students to solve the problems numerically using Scilab or C++. Hence the students can have a good understanding of the problems and their solutions.	P11.1 Scilab based program is written for solving the s-wave Schrodinger equation for ground and first exited states of hydrogen atom. P11.2 Scilab based program is written for solving the s-wave radial Schrodinger equation for an atom. P11.3 Scilab based program is written for solving the s-wave radial Schrodinger equation for a particle of mass m. P11.4 Scilab based program is written for solving the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule.
			CC – XII Theory	SOLID STATE PHYSICS	In this course the students have an exposure on crystal structure of materials, lattice dynamics, magnetic and dielectric properties of matter and superconductivity. The	T12.1 The theory of crystal structure is introduced here. T12.2 Elementary lattice dynamics is introduced here. T12.3 Magnetic properties of matter are discussed here.

					students here have the opportunity to learn several applications of quantum mechanics in solid materials.	T12.4 Dielectric properties of materials are discussed here. T12.5 Ferroelectric properties of materials are introduced here. T12.6 Elementary band theory is introduced in this unit. T12.7 Superconductivity is introduced here.
			CC – XII Practical	SOLID STATE PHYSICS Lab	This practical classes develops the skill in the students to measure and study several properties of matter studied in the theory course such as dielectric constant, band gap of a thermistor, PE hysteresis loop of a ferroelectric crystal, BH curve for a ferromagnetic material, Hall coefficient of a semiconductor etc.	P12.1. This practical is performed to measure the Dielectric Constant of a dielectric Materials with frequency. 2. This practical is performed to determine the band gap using a thermistor. 3. This practical is performed to study the PE Hysteresis loop of a Ferroelectric Crystal. 4. This practical is performed to draw the BH curve of Ferromagnetic material using Solenoid & determine energy loss from Hysteresis. 5. This practical is performed to measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 0C) and to determine its band gap. 6. This practical is performed to determine the Hall coefficient of a semiconductor sample.
			DSE-1: (1) Theory	ADVANCED MATHEMATICAL PHYSICS	This course on mathematical physics provides the students with an opportunity to learn some advanced topics of mathematics required for the students of physics like Linear	DT1.1 Linear vector space is introduced in this unit. DT1.2 Theory and application of metrices are introduced here. DT1.3 The theory cartesian tensors are introduced here.

					vector spaces, matrices and tensors. The students learn set theory, group theory, vector spaces and their applications in physics. They are also taught the tensor analysis and several problems related to physics in this course. The problem solving aptitude of the students are greatly enhanced through this course.	DT1.4 The theory of General tensors are introduced here.
			DSE-1: (1) Practical	ADVANCED MATHEMATICAL PHYSICS	The problems analytically studied in the theory classes are analysed in the practical classes through computational software Scilab. The students develops their computational skill through these classes by writing several codes on matrices, differential operators, vector space and problems of classical mechanics and quantum mechanics.	DP1.1 Scilab base programmes for matrix multiplication, eigen value and eigen vector computations are performed. DP1.2 Orthogonal polynomials as eigen functions of hermitian differential operators are computed in this practical. DP1.3 This practical determines the principal axes of moment of inertia by matrix diagonalization in Scilab. DP1.4 Various problems of wave functions in quantum mechanics is discussed and computed here. DP1.5 Scilab program is written for analysis of Lagrangian formulation of classical mechanics with constraints. DP1.6 Scilab is used to study the geodesics in Euclidean and opther spaces. DP1.7 Scilab program is used to estimate the ground state energy and wave function of a quantum system.

			DSE-2 : (5) Theory	CLASSICAL DYNAMICS	This course offers some advanced topic of classical mechanics such as Lagrangian and Hamiltonian formulations and its applications. The students also learn the special theory of relativity in four-vector formalism in a great detail. In addition to those, dynamics of fluids are also taught in this course.	DT2.1 Classical mechanics of point particles is discussed in this unit. DT2.2 Theory of small amplitude oscillations is introduced in this unit. DT2.3 Special theory of relativity is introduced in this unit. DT2.4 Fundamentals of fluid dynamics are introduced here.
		Sem-VI	CC – XIII Theory	ELECTRO MAGNETIC THEORY	This is very important course as the theory of optics taught in previous semester, is explained on the basis of electromagnetic theory. The students learn about Maxwell equations, electromagnetic wave propagation in bounded and unbounded media. Moreover the theory of polarization and its applications in optical instruments are the very useful part of this course. The students also have the opportunity to learn about the optical fibres and their uses.	T13.1 Maxwell's equations of electrodynamics is introduced here. T13.2 Electromagnetic wave propagation in unbounded media is introduced here. T13.3 Electromagnetic wave in bounded media is introduced here. T13.4 Polarization of electromagnetic waves is introduced here. T13.5 Rotatory polarization is introduced here. T13.6 Theory of wave guides is introduced here. T13.7 Optical fibres are introduced here.
			CC – XIII Practical	ELECTRO MAGNETIC THEORY Lab	This is very useful practical classes where the students get their skills improved by setting simple optical instruments to measure few properties or laws of optics. The students also learn about the	P13.1 This practical is introduced to determine the specific rotation of sugar solution using Polarimeter. P13.2 This practical is performe to analyze elliptically polarized Light by using a Babinet's compensator. P13.3 This practical is per-

					measurement techniques of semiconductor physics in this course.	formed to determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the diffraction through ultrasonic grating. P13.4 This practical is performed to determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a Gaussian eyepiece. P13.5 This practical is performed to verify the law of Malus for plane polarized light. P13.6 This practical is performed to determine the Boltzmann constant using V-I characteristics of PN junction diode.
			CC – XIV Theory	STATISTICAL MECHANICS	This course introduces to the students the theory of classical and quantum statistics and its applications in physics to establish a connection between microscopic and macroscopic world. The students learns about the classical and quantum theory radiation, Bose-Einstein statistics, Fermi-Dirac statistics etc. This elaborate course will help the students in future studies.	T14.1 The classical statistics is introduced here. T14.2 The classical theory of radiation is discussed here. T14.3 Quantum theory of radiation is introduced here. T14.4 Bose-Einstein statistics is introduced here. T14.5 Fermi-Dirac statistics is introduced here.
			CC – XIV Practical	STATISTICAL MECHANICS Lab	In this course the students learn about the computational techniques in statistical physics using Scilab computing software. They study the behavior of statistical system by using computer	P14.1 Computational analysis of the behavior of a collection of particles in a box satisfying Newtonian mechanics and interact via the Lennard-Jones potential is performed in Scilab with the variable number of particles and different initial conditions. P14.2 Scilab program is written

					programming in Scilab. They plot the results and analyse several statistical systems. In this way they build up their skill in computation.	for computation of the partition function Z(β) for examples of systems with a finite number of single particle levels (e.g., 2 level, 3 level, etc.) and a finite number of non-interacting particles N under Maxwell-Boltzmann, Fermi-Dirac and Bose- Einstein statistics. P14.3 Scilab code is done to plot Planck's law for Black Body radiation and compare it with Raleigh-JeansLaw at high temperature and low temperature. P14.4. Scialb code is written fo plotting Specific Heat of Solids (a) Dulong-Petit law, (b) Einstein distribution function, (c) Debye distribution function for high temperature and low temperature and compare them for these two cases. P14.5 Scilab code is used to plot the following functions with energy at different temperatures in a) Maxwell-Boltzmann distribution b) Fermi-Dirac distribution c) Bose-Einstein distribution.
			DSE- 3: (6) Theory	Nuclear and Particle Physics	This course discusses the nuclear and particle physics in a great detail. The students learn general properties of nuclei, nuclear models, radioactivity, nuclear reactions, particle physics etc. They gather a vast knowledge through this course which will help them in further advanced study of Nuclear and Particle Physics.	DT3.1 General properties of Nuclei are discussed here. DT3.2 Nuclear models are discussed here. DT3.3 Radioactivity decay is introduced here. DT3.4 Nuclear reactions are introduced here. DT3.5 Interaction of nuclear radiation with matter is discussed here. DT3.6 Various detector for detecting nuclear radiations are

						discussed here. DT3.7 Particle accelerator is introduced here. DT3.8 Theory of particle physics is introduced here.
			DSE- 4: (8)	Astronomy & Astrophysics	The students get to learn the Astronomy and Astrophysics through this course. This course starts with preliminaries of Astronomy and Astronomical techniques and offers the detailed discussions on the Sun, the physics of galaxies including the milky way galaxy. In addition to this basic theory of cosmology is introduced to the students. This course will no doubt help the students in future study of Astronomy & Astrophysics.	DT4.1 Various astronomical scales for measurements are introduced here. DT4.2. Different types of telescopes are introduced here. Brief overview of gravitation in astronomy is also discussed along with the description of systems in thermodynamic equilibrium. DT4.3. Theory of the Sun is introduced in details. DT4.4. The theory of the galaxy is introduced along with detailed discussion of our galaxy Milky Way. DT4.5. Large scale structure and the expanding universe is discussed in details.