BISHOP HEBER COLLEGE (AUTONOMOUS)
TIRUCHIRAPPALLI – 620017
TAMILNADU, INDIA

COURSE OUTCOMES

DEPARTMENT OF PHYSICS

STRUCTURE OF THE SYLLABUS

PROGRAM NAME	COURSE	COURSE CODE	COURSE NAME
B Sc Physics	Core I	U21PH101	Properties of Matter
B Sc Physics	Core Prac. I	U21PH1P1	Major Practicals - I
B Sc Physics	Core II	U21PH202	Mechanics
B Sc Physics	Core Prac. II	U21PH2P2	Major Practicals - II
B Sc Physics	SBEC I	U21PH2S1	SBEC - 1 - Bio Phyics and Bio Medical Instrumentation
B Sc Physics	Core III	U21PH303	Thermal Physics
B Sc Physics	Core Prac. III	U21PH3P3	Major Practicals - III
B Sc Physics	Core IV	U21PH404	Optics
B Sc Physics	Core Prac. IV	U21PH4P4	Major Practicals - IV
B Sc Physics	Core V	U21PH505	Electricity Magnetism and Electro Magnetism
B Sc Physics	Core VI	U21PH506	Electronic Devices
B Sc Physics	Core Prac. V	U21PH5P5	Major Practicals - V
B Sc Physics	Core Project	U21PH5PJ	Core Project
B Sc Physics	Elective I	U16PH5:1	Atomic Physics
B Sc Physics	Elective I	U16PH5:2	Communication System
B Sc Physics	Elective I	U16PH5:B	Astronomy and Astrophysics
B Sc Physics	Elective I	U16PH5:C	Python
B Sc Physics	SBEC II	U16PHPS2	Physics content development (Theory and Practicals)
B Sc Physics	SBEC III	U16PHPS3	Web Designing (Theory and Practicals)
B Sc Physics	Core VII	U16PH607	Nuclear Physics, Wave Mechanics and Relativity
B Sc Physics	Core VIII	U16PH608	Solid State Physics
B Sc Physics	Elective II	U16PH6:1	Digital Electronics
B Sc Physics	Elective II	U16PH6:2	Crystal Growth and Thin Film Physics
B Sc Physics	Elective II	U16PH6:B	Energy Physics
B Sc Physics	Elective II	U16PH6:C	Mathematical Methods and Physicists
B Sc Physics	Elective III	U21PH6:3	Programming in C
B Sc Physics	Elective III	U21PH6:4	Spectroscopy and Lasers
B Sc Physics	Elective III	U21PH6:E	Non - Destructive Testing and Evaluation
B Sc Physics	Elective III	U21PH6:F	Statistical Methods
B Sc Physics	Core Prac. VI	U21PH6P6	Major Practicals - VI

CORE-I: PROPERTIES OF MATTER AND ACOUSTICS
SEMESTER: I **COURSE CODE: U21PH101**
CREDITS: 5 **TOTAL HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Measure different kinds of moduli of elasticity.	K5	I
CO2	Interpret the concept and consequences of gravitation and its applications	K5	II
CO3	Classify the liquids based on viscous property.	K4	III
CO4	Estimate surface tension of liquids subjected to boundary conditions	K5	IV
CO5	Correlate the wave nature and analyze the laws of transverse vibrations	K4	V
CO6	Investigate the factors affecting the acoustics of buildings	K3	V

CORE - II: MECHANICS
SEMESTER: II **CODE: U21PH202**
CREDITS: 4 **NO OF HOURS/WEEK: 5**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the concept of Centre of gravity, friction and Equilibrium of a body in the presence and absence of external force.	K2	I
CO2	Estimate the physical parameters involved in projectile motion using Newton's equation of motion.	K5	II
CO3	Calculate moment of inertia of regular geometric structures using parallel and perpendicular axes theorem.	K5	III
CO4	Determine the value of 'g' using different pendulums (Compound, Kater's) and explain the theory of oscillation.	K5	IV
CO5	Explain certain static and dynamic properties of fluids.	K2	V
CO6	Outline the applications of Bernoulli's and Torricelli's theorem.	K2	

CORE - III: THERMAL PHYSICS

SEMESTER: III **CODE: U21PH303**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Recall the fundamental laws of thermodynamics, radiation and statistical mechanics and their importance	K2	I, III, V
CO2	Summarize the theories related to low temperature, radiation and specific heat of solid, liquid and gas.	K2	II, III, IV
CO3	Model internal combustion engine, different experimental methods for production of low temperature, measurement of high temperature and specific heats of solid, liquid, gas.	K3	I, II, III, IV
CO4	Analyze the distribution of energy in black body spectrum, system of boson and fermions, variation of specific heat of solids and gases with respect to temperature.	K4	III, IV, V
CO5	Evaluate specific heat capacity of solid, liquid and gas theoretically.	K5	III, IV, V
CO6	Estimate the energy distribution in black body radiation, system of bosons and fermions.	K6	III, V

CORE - IV: OPTICS

SEMESTER IV **CODE: U21PH404**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Develop the theory of interference for various optical waves	K3	I
CO2	Determine the wavelength and thickness of transparent film using different interferometer	K5	I
CO3	Apply the phenomenon of diffraction of light in analyzing pulse dynamics in optical media	K3	II
CO4	Analyze the polarization evolution in optical systems	K4	III
CO4	Classify the types of aberrations in lens	K2	IV
CO6	Determine the resolving and dispersive power of various optical instruments.	K5	V

CORE-V: ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM
SEMESTER: V **CODE: U21PH505**
CREDITS: 5 **NO OFHOURS/WEEK: 5**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the fundamental laws of Electrostatics, Magnetostatics and electromagnetism.	K2	I, II, III & V
CO2	Explain the principles behind the electric and magnetic instruments.	K2	I, II & III
CO3	Organize experiments to determine the absolute values of inductance, Figure of merit of Galvanometer, Q factor and power factor of LCR circuits.	K3	II, III & IV
CO4	Analyse the behavior of circuits containing Inductance, Capacitance and Resistance connected in different combinations.	K4	IV
CO5	Evaluate the electric, magnetic and electromagnetic fields due to different electric structures and current circuits.	K5	I, II & III
CO6	Estimate the energy involved in sharing of charges, Magnetization and in electromagnetic waves.	K6	I, III & V

CORE – VI: ELECTRONIC DEVICES
SEMESTER: V **CODE: U21PH506**
CREDITS: 5 **NO. OF HOURS/WEEK: 5**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Analyze the physical operation and applications of semiconductor devices like diodes, rectifiers and filters	K4	I
CO2	Explain the basic operations of BJT and FET in various configuration	K2	II
CO3	Categorize the different power amplifier circuits, their design and use in electronics and communication circuits	K4	III
CO4	Infer the characteristics of feedback amplifier circuits	K4	IV
CO5	Analyze different oscillator circuits for various range of frequencies	K4	IV
CO6	Construct circuits for various mathematical operations using operational amplifier	K6	V

CORE - VII: NUCLEAR PHYSICS, WAVE MECHANICS AND RELATIVITY
SEMESTER: VI **CODE: U16PH607**
CREDITS: 5 **NO. OF HOURS/ WEEK: 6**

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the basic properties of nuclei, postulates of wave mechanics and relativity.	K2	I, IV, V
CO2	Explain the limitations of Newton's law of motion and black body radiation from Planck's hypothesis	K2	III, V
CO3	Identify the elementary particles based on the quantum numbers, select suitable method of detection for various nuclear radiations and model nuclear reactors, atom bomb, Electron microscope.	K3	I, II
CO4	Analyze various experiments that reveal the dual nature of matter and theories related to nuclear reactions.	K4	II, III
CO5	Assess relativistic variation in mass, velocity, time and position, binding energy of nucleus and the energy released in nuclear reactions.	K5	I, II, V
CO6	Formulate Schrödinger equation for simple quantum mechanical systems and solve it to find the wave function and energy.	K6	IV

CORE - VIII: SOLID STATE PHYSICS
SEMESTER: VI **CODE : U16PH608**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the basics of crystal structure	K2	I
CO2	Compare the types of bonding in solids	K4	II
CO3	Analyze electrical and thermal properties of metals	K4	III
CO4	Interpret electrical conductivity of semiconductors	K5	IV
CO5	Explain the theories and properties of semiconductors and superconductors	K5	IV, V
CO6	Categorize the superconductors based on their properties	K4	V

ELECTIVE - I: ATOMIC PHYSICS

SEMESTER: V **CODE: U16PH5:1**
CREDITS: 5 **NO. OF HOURS / WEEK: 5**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the basic properties of positive rays, models of atoms, atomic spectra, photo-electricity, X-rays and classify elements.	K2	I - V
CO2	Make use of atom models to explain the spectral behavior of atoms when they are free and under the influence of external magnetic fields and model photovoltaic cells.	K3	II & V
CO3	Organize experiments to determine e/m of positive rays, critical potential, Planck's constant and structure of crystals and to prove Vector atom model.	K3	I, II, III & V
CO4	Analyze the interactions of electromagnetic waves with matter	K4	IV & V
CO5	Evaluate Zeeman shift, Lande's g-factor, magnetic dipole moment of electron, structure of crystals.	K5	II, III & V
CO6	Construct a basic photovoltaic cell.	K6	IV

ELECTIVE - I: COMMUNICATION SYSTEM

SEMESTER: V **CODE: U16PH5: A**
CREDITS: 5 **NO. OF HOURS/WEEK: 5**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Outline the basics of noise in communication	K2	I
CO2	Classify the modulations on the basis of frequency	K3	II
CO3	Apply the concept of different type of pulse modulation in communication	K3	III
CO4	Analyze the network and controls in data communication	K4	IV
CO5	Utilize the analog and digital modulation schemes in fiber optical communication	K3	V
CO6	Explain the emitter design and detector design in fiber optical communication	K4	V

ELECTIVE - I: ASTRONOMY AND ASTROPHYSICS

SEMESTER: V **CODE: U16PH5:B**

CREDITS: 5 **NO OF HOURS/WEEK: 5**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the concept of naked eye astronomy for identification of stars or group of stars in the night sky, earth rotation and other moving body in the space.	K2	I
CO2	Estimate the accurate position of the objects in the space by Co-ordinate system and find sunset, sunrise, sidereal time and season.	K5	II
CO3	Explain the concept of basic structure of sun with other planets and comets, meteors, asteroids.	K5	III
CO4	Discuss Kepler law, law of motion, Newton gravitation theory, Hubble's law and Einstein Gravitation theory.	K5	IV
CO5	Explain milky way and galaxies, origin and evolution.	K2	V
CO6	Explain importance of expanding universe and its stability, life in the universe.	K2	

ELECTIVE - I: PYTHON

SEMESTER: VI **CODE: U16PH5:C**

CREDITS: 5 **NO OF HOURS/WEEK: 5**

At the end of this course, the students will be able to

CO. NO.	Course outcomes	Level	Unit Covered
CO1	Recall the basic structure of python program using constants, variables, datatypes and list.	K1	I
CO2	Demonstrate the conditional and looping statements to understand the concept of programming language	K2	II
CO3	Apply the different categories of user defined function and classes in python	K3	III
CO4	Analyze the appropriate functions and libraries for drawing the plots and data analysis	K4	IV
CO5	Evaluate the fundamental data structures and associated algorithms for solving substantial problems in python	K5	III, IV, V
CO6	Design and develop programs to solve real time problems numerically	K6	V

ELECTIVE - II: DIGITAL ELECTRONICS

SEMESTER: VI **CODE: U21PH6:1**

CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course outcomes	Level	Unit Covered
CO1	Classify and convert the different types of number systems used in digital communication	K2	I
CO2	Apply Boolean laws and Karnaugh map to construct most simplified digital circuits	K3	I, II
CO3	Analyze different types of digital circuits using logical tools	K4	III
CO4	Asses the various sequential logical circuits for particular operation	K5	IV
CO5	Explain the architecture, organization and operation of the 8085 microprocessor.	K5	V
CO6	Develop assembly language programme to perform mathematical operations in 8085 microprocessor	K6	V

ELECTIVE -II: CRYSTAL GROWTH AND THIN FILM PHYSICS

SEMESTER: IV **CODE: U16PH6: A**

CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the theory of nucleation and crystal growth.	K2	I
CO2	Discuss the significance of single crystals and list their applications	K4	I
CO3	Classify the different crystal growth techniques outline their principles and infer the advantages and disadvantages.	K4	II, III
CO4	Contrast different thin film coating techniques.	K4	IV
CO5	Explain thermodynamics and kinetics of thin film deposition process	K2	V
CO6	List the various applications of Thin films in different areas of physics.	K4	V

ELECTIVE -II: CRYSTAL GROWTH AND THIN FILM PHYSICS
SEMESTER: IV **CODE: U16PH6: A**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the theory of nucleation and crystal growth.	K2	I
CO2	Discuss the significance of single crystals and list their applications	K4	I
CO3	Classify the different crystal growth techniques outline their principles and infer the advantages and disadvantages.	K4	II, III
CO4	Contrast different thin film coating techniques.	K4	IV
CO5	Explain thermodynamics and kinetics of thin film deposition process	K2	V
CO6	List the various applications of Thin films in different areas of physics.	K4	V

ELECTIVE – II: MATHEMATICAL METHODS FOR PHYSICISTS
SEMESTER : VI **CODE: U16PH6:C**
CREDITS: 5 **NO. OF HOURS/WEEK: 6 .**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Evaluate the integral of complex numbers using de Moivre's theorem, integration of vectors, first order ordinary differential equations and definite integrals using gamma, beta functions	K5	I, II, IV, V
CO2	Apply Cauchy-Riemann conditions to test analyticity of complex function, row reduction to find rank of a matrix	K3	I, III
CO3	Outline the complex numbers, types and role of matrices in Physics, Gamma and beta functions.	K2	I, III,V
CO4	Extend the separable method for the solution of first order ordinary differential equations and Gauss divergence theorem for volume integrals	K2	II, IV
CO5	Analyze initial value problem of ordinary differential equations with boundary conditions in physical problems	K4	IV
CO6	Construct characteristic equation from system of linear equations and Recursion relation of gamma function	K3	III, V

ELECTIVE - III: PROGRAMMING IN C

SEMESTER: VI **CODE: U21PH6:3**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course outcomes	Level	Unit Covered
CO1	Recall the basic structure of C program using constants, variables, datatypes and operators	K1	I
CO2	Demonstrate the conditional and looping statements to understand the concept of programming language	K2	II
CO3	Apply the concept of arrays, structures and union in solving problems	K3	III
CO4	Analyze and classify the different categories of user defined function in C	K4	IV
CO5	Explain the importance of pointer variables and various file operations	K5	V
CO6	Design and develop programs by applying all learned concepts to solve real time problems	K6	V

ELECTIVE - III: SPECTROSCOPY AND LASERS

SEMESTER: VI **CODE: U21PH6:D**
CREDITS: 5 **NO. OF HOURS / WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the basic concept of spectroscopy and its types which includes Microwave, IR and Raman.	K2	I - III
CO2	Explain the fundamentals of lasers and its types.	K2	IV & V
CO3	Identify the characteristics of EM radiation and its application in the spectroscopic studies	K3	I, II & III
CO4	Identify the applications and levels of laser	K3	IV & V
CO5	Analyze the models of SHM and Rigid Rotor to study the rotation and vibration of molecules using IR and Raman spectroscopy and the energy levels for laser action in some selected types	K4	II, III, IV & V
CO6	Evaluate the energy of the vibrating and rotating molecules using IR and Raman spectroscopy and Einstein Coefficients for laser action and wavelength of the laser emitted in some selected types	K5	I to V

ELECTIVE – III: NON-DESTRUCTIVE TESTING AND EVALUATION

SEMESTER: VI **CODE: U21PH6:E**

CREDITS: 5 **NO. OF HOURS / WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO 1	Discuss Non-destructive testing methods for the detection of manufacturing defects of materials.	K6	I
CO 2	Infer Liquid penetrant Testing, Magnetic particle testing, testing procedures and results.	K2	II
CO 3	Explain Thermography, Eddy current -Principles, Techniques of liquid crystals, Eddy current testing, sensing elements and instrumentation.	K5	III
CO 4	Discuss Ultrasound testing's, Acoustic emission techniques principle and applications.	K6	IV
CO 5	Explain interaction of X-ray with matter and imaging.	K2	V
CO6	Explain Fluoroscopy, Xero-Radiography, Computed Radiography, Computed Tomography characteristics curves, penetrameters, Exposure charts.	K2	

ELECTIVE - III: STATISTICAL METHODS

SEMESTER: VI **CODE: U21PH6:F**

CREDIT:5 **NO OF HOURS/WEEK: 6**

CO.NO.	Course Outcomes	Level	Units covered
CO1	Analyse a representative subset of data points to identify patterns and trends in the larger data set being examined	K4	I
CO2	Utilize charts and graphs to display and interpret numerical data, functions, and other qualitative structures.	K3	II
CO3	Estimate the central tendency of the statistical data and how it is distributed.	K5	II
CO4	Facilitate comparative study of two or more frequency distribution regarding their shape and pattern.	K5	III
CO5	Examine the strength and direction of the linear relationship between a pair of observations.	K4	IV
CO6	Construct a curve or a mathematical function that has the best fit to a series of data points. Make predictions of underlying mechanisms which produced the data.	K3	V

SBEC - I: BIOPHYSICS AND BIOMEDICAL INSTRUMENTATION
SEMESTER: II **CODE: U21PH2S1**
CREDITS: 2 **NO. OF HOURS/WEEK: 2**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Infer the structure of amino acids, proteins, DNA and their types.	K4	I
CO2	Apply the concepts of electrical and electronics to design electrodes and transducers.	K3	II
CO3	Categorize various pre-amplifiers and different types of electrodes to analyze bio-signals.	K4	III
CO4	Analyze the working of various Bio-potential recorders.	K4	IV
CO5	Analyze the origin and acquisition of bio potentials and bioelectric signals such as ECG, EEG etc.,	K4	V
CO6	Discuss the operation principles of pacemaker, defibrillator, nerve stimulators, kidney machines.	K4	V

SBEC-II: Concepts through animations
(THEORY AND PRACTICAL)
SEMESTER: V **CODE: U21PHPS2**
CREDITS: 2 **NO. OF HOURS/WEEK: 2**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Apply the basic tools of Flash, Photoshop and Adobe Premier software.	K3	I, III, V
CO2	Develop action scripts and record audio for the E-content	K5	II, V
CO3	Organize a new Photoshop and video files with multiple layer adjustments such as exploring, deleting and merging etc.	K3	III, V
CO4	Synchronize audio and video files as per the desired timeline.	K5	I, II, V
CO5	Edit audio and video files using appropriate tools	K5	I, II, III, IV, V
CO6	Create scientific content with essential animations using appropriate tools	K6	I, II, V

SBEC - III: WEB DESIGNING
(THEORY AND PRACTICAL)

SEMESTER: VI **CODE: U21PHPS3**
CREDITS: 2 **NO. OF HOURS/WEEK: 2**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO 1	Develop HTML coding for webpage	K2	I
CO 2	Demonstrate and display HTML web site folders.	K3	II
CO 3	Design graphics and hyperlinks in web pages	K3	III
CO 4	Implement other software within the webpage using various methods.	K6	IV
CO 5	Create HTML functions to link different web pages	K6	V
CO 6	Create, edit, delete and manage different forms and fields in a website	K6	V

NMEC-I: ELECTRICAL APPLIANCES

SEMESTER: III **CODE: U21PH3E1**
CREDITS: 2 **NO. OF HOURS/WEEK: 2**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Recall the basics of electricity	K1	I
CO2	Outline the risk factors and precautionary steps to avoid electric shock.	K2	I
CO3	Explain the types of electrical wiring & various heating appliances	K2	II
CO4	Outline the principles & working of moving coil instruments	K2	III
CO5	Explain the functioning of several home appliances	K4	IV
CO6	Apply electromagnetic theory to day to day electrical appliances.	K3	V

NMEC - II: AUDIO AND VIDEO SYSTEMS

SEMESTER: IV **CODE: U21PH4E2**
CREDITS: 2 **NO.OF HOURS/WEEK: 2**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Outline the nature and production of sound waves	K2	I
CO2	Classify the different types of microphones and loudspeakers	K2	II
CO3	Compare the functioning of monochrome and colour television	K4	III
CO4	Explain the transmission and reception of digital signals in the communication system	K3	IV
CO5	Explain the operating principles of electronic display devices (LCD & LED)	K2	V
CO6	Outline the principle, instrumentation, working of audio and video system	K4	II - V

ALLIED PHYSICS - I (FOR I B.Sc. MATHS)
MECHANICS, SOUND, THERMAL PHYSICS AND OPTICS

SEMESTER: I **CODE: U21PHY01**
CREDITS: 4 **NO. OF HOURS/WEEK: 4**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Deduce Centre of Gravity for different geometrical structures	K4	I
CO2	Measure the metacentric height of a ship with the knowledge of stability of floating bodies	K5	I
CO3	Investigate the acoustics of buildings and Simple Harmonic Motion (SHM)	K4	II
CO4	Determine the various elastic modulii of materials	K5	III
CO5	Estimate the thermal properties of solids and fluids.	K5	IV
CO6	Explain the principles of spectroscopy and the importance of fibre optic communication systems.	K5	V

ALLIED PHYSICS I
(FOR II B.Sc. CHEMISTRY)
MECHANICS, SOUND,THERMAL PHYSICS AND OPTICS
SEMESTER: III **CODE: U21PHY33**
CREDITS : 3 **NO. OF HOURS/WEEK: 4**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Deduce Centre of Gravity for different geometrical structures	K4	I
CO2	Measure the metacentric height of a ship with the knowledge of stability of floating bodies	K5	I
CO3	Investigate the acoustics of buildings and Simple Harmonic Motion (SHM)	K4	II
CO4	Determine the various elastic modulii of materials	K5	III
CO5	Estimate the thermal properties of solids and fluids.	K5	IV
CO6	Explain the principles of spectroscopy and the importance of fibre optic communication systems.	K5	V

ALLIED PHYSICS – II
(FOR II B.Sc. MATHS)
ELECTRICITY, ATOMIC,NUCLEAR PHYSICS AND ELECTRONICS
SEMESTER: IV **CODE: U21PHY02**
CREDITS: 4 **NO. OF HOURS /WEEK: 4**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Explain Coloumb's theorem and the principle of capacitors.	K2	I
CO2	Assess effective current and voltage in electrical circuits using kirchoff's law and self and mutual inductance of the coils using principle of electromagnetic induction.	K5	II
CO3	Utilize X-ray diffraction technique to characterize the samples and identify the Quantum numbers based on vector atom model.	K3	III
CO4	Explain various nuclear models and the principle of particle detectors.	K2	IV
CO5	Classify solids based on band theory and categorize the semiconductors.	K4	V
CO6	Evaluate numerical equivalence between different number systems and simplified Boolean expression.	K5	5

ALLIED PHYSICS - II
(FOR II B.Sc. CHEMISTRY)
ELECTRICITY, ATOMIC, NUCLEAR PHYSICS AND ELECTRONICS
SEMESTER: IV **CODE: U21PHY44**
CREDITS: 4 **NO. OF HOURS/WEEK: 4**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Explain Coloumb's theorem and the principle of capacitors.	K2	I
CO2	Assess effective current and voltage in electrical circuits using kirchoff's law and self and mutual inductance of the coils using principle of electromagnetic induction.	K5	II
CO3	Utilize X-ray diffraction technique to characterize the samples and identify the Quantum numbers based on vector atom model.	K3	III
CO4	Explain various nuclear models and the principle of particle detectors.	K2	IV
CO5	Classify solids based on band theory and categorize the semiconductors.	K4	V
CO6	Evaluate numerical equivalence between different number systems and simplified Boolean expression.	K5	V

APPLIED PHYSICS I
(FOR II B.Sc. COMPUTER SCIENCE)
ELECTRICITY, MAGNETISM AND ELECTROMAGNETISM
SEMESTER: III **CODE: U21PHZ34**
CREDITS: 3 **NO. OF HOURS/ WEEK: 4**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the principle of Electrostatics	K2	I
CO2	Estimate the capacity of Spherical and cylindrical capacitors	K5	I
CO3	Classify materials based on its magnetic properties	K3	II
CO4	Measure current and resistance in electrical circuits using Kirchhoff's laws and Wheatstone's principle	K5	III
CO5	Analyze self-inductance and Mutual inductance using Faraday's laws of Electromagnetic induction	K4	IV
CO6	Examine current and impedance in Single, double and tri component	K4	V

APPLIED PHYSICS II
(FOR II B.Sc. COMPUTER SCIENCE)
SOLID STATE DEVICES AND MICROPROCESSOR
SEMESTER: IV **CODE: U21PHZ45**
CREDITS: 4 **NO. OF HOURS/WEEK: 4**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain semiconductors, characteristics of diodes & their applications	K2	1
CO2	Analyse the Characteristics of Transistors & FET	K4	1
CO3	Utilize Operational Amplifier to perform several mathematical operations	K3	2
CO4	Outline the evolution and Architecture of Microprocessor Intel 8085.	K2	3
CO5	Explain the addressing modes and functioning of various Instruction set of Intel 8085.	K2	4
CO6	Develop simple assembly language programs.	K3	5

MAJOR PRACTICALS - I
SEMESTER: I **CODE: U21PH1P1**
CREDITS: 3 **NO. OF HOURS/WEEK:3**

At the end of this course, the students will be able to

CO.NO.	Course outcomes	Level	Experiment Covered
CO1	Determine surface tension and interfacial tension by weight drop method	K5	3
CO2	Analyze the basic operations and the characteristics of Zener diode in various configuration	K6	6
CO3	Demonstrate and apply the concept of optical theory of lenses to find the focal Length, radius of curvature of long focus convex lens	K2	5
CO4	Determine the frequency of AC mains using Sonometer and find wavelength, period, amplitude using Meldes method	K5	4,13
CO5	Estimate the moduli of elasticity, rigidity modulus for different materials using non uniform bending pin and microscope and torsion method.	K6	1,14
CO6	Determine refractive index of given prism by spectrometer and measure g and K using compound pendulum.	K5	2,8,14

MAJOR PRACTICALS - II

SEMESTER: II **CODE: U21PH2P2**
CREDITS: 3 **NO. OF HOURS/WEEK: 3**

At the end of this course, the students will be able to

CO.NO.	Course outcomes	Level	Experiment Covered
CO1	Measure the coefficient of viscosity of low and highly viscous liquids using graduated burette, Ostwald's viscometer and Stoke's method	K5	2,5,14
CO2	Analyze the basic operations and the characteristics of Zener diode in various configuration	K4	7
CO3	Apply the concept of optical theory of lenses to find the focal Length, radius of curvature and the refractive index of long focus concave lens	K3	6
CO4	Determine the frequency of AC mains using Sonometer.	K5	3
CO5	Estimate the moduli of elasticity for different materials using optic lever and torsional pendulum.	K5	1,4
CO6	Make use of CRO, AFO and multimeter to study the frequency resonant circuit, Lissajous figures, different waveforms and basic electrical measurements	K3	10,12,13

MAJOR PRACTICALS - III

SEMESTER: III **CODE: U21PH3P3**
CREDITS: 3 **No. OF HOURS.WEEK: 3**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Experiment covered
CO1	Determine thermal constants (specific heat, thermal conductivity) of substances.	K1	1,2,3
CO2	Analyze the properties of light (interference, refraction and polarization).	K5	4,5
CO3	Design rectifier circuits using diodes.	K6	6
CO4	Analyze transistor characteristics in CE mode	K4	11
CO5	Analyze the solar spectrum	K2	9
CO6	Estimate the sensitivity of a galvanometer (B.G).	K3	8

MAJOR PRACTICALS - IV

SEMESTER: IV **CODE: U21PH4P4**
CREDITS: 3 **NO. OF HOURS/WEEK: 3**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Experiment Covered
CO1	Measure the temperature co- efficient of materials using potentiometer and P.O. Box.	K5	3,6,12,13
CO2	Determine emissivity of blackened surface of the Spherical calorimeter.	K5	1
CO3	Construct circuit diagram to find specific resistance and calibrate low range voltmeter.	K3	4,5
CO4	Determine thickness of wire, films and wave length of visible light (direct and oblique method) by using spectrometer- Grating.	K5	2,7,10,11
CO5	Make use of optical microscope to identify the microstructure of samples.	K3	9
CO6	Verify the function of logic gates using discrete components.	K2	8

MAJOR PRACTICALS - V

SEMESTER: V **CODE: U21PH5P5**
CREDITS:3 **No. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course outcomes	Level	Experiments covered
CO 1	Recall the laws in specific area and apply it to estimate the physical properties of materials	K1	1,3,4,14
CO2	Illustrate the functions of important circuits that are used to measure electrical properties of components.	K2	12
CO3	Conduct experiments to measure the physical observables.	K3	7,8,9,13,16,17,18,19,20
CO4	Analyze the quality of equipment's based on the observations	K4	2,5,610,11,15
CO5	Conduct experiments to demonstrate the relation between different properties of materials	K5	21
CO6	They have acquiring computational skills in C language	K6	22,23,24,25,26

MAJOR PRACTICALS - VI

SEMESTER:VI **COURSE CODE: U21PH6P6**
CREDITS: 3 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Experiments Covered
CO1	Explain the characteristics of FET and its working as an amplifier.	K4	1,2
CO2	Recall basic logic gates, Boolean algebra and modify digital circuits using K-map.	K6	3,4,5,6
CO3	Design amplifier and oscillator circuits using bipolar transistors.	K6	7,8,9,10
CO4	Analyze low pass and high pass filter circuits using operational amplifier.	K6	11,12,13
CO5	Develop assembly language program to perform various operations using 8085 microprocessors	K6	14,15
CO6	Explain voltage regulation using Zener diode.	K4	16

ALLIED PHYSICS PRACTICAL
(FOR I B.Sc.1 MATHS AND II B.Sc. CHEMISTRY)

SEMESTER: I & II / III & IV **CODE: U21PHYP1**
CREDITS: 4 **NO. OF HOURS/WEEK:3**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Experiment Covered
CO1	Measure the coefficient of viscosity of liquids using graduated burette method and find surface tension using drop weight method	K5	2,15
CO2	Determine the Horizontal intensity of earth magnetic field and magnetic moment using Tangent galvanometer.	K5	5,6
CO3	Measure series and parallel resistance, specific resistance, using potentiometer, Carey fosters bridge.	K3	11,12
CO4	Examine specific heat capacity of two different liquids using Newton's law of cooling method and thermal conductivity of a bad conductor using Lee's disc method.	K4	3,4
CO5	Apply optical theory find the radius of curvature of a given convex lens using Newton rings method and the refractive index of prism using spectrometer.	K3	7,9
CO6	Test Laws of transverse vibrations and find AC frequency of a given string and young's modulus of a non-uniform bending of a bar using pin and Microscope method.	K4	1,8,10

APPLIED PHYSICS PRACTICAL
(FOR II B.S COMPUTER SCIENCE)

SEMESTER: III & IV **CODE: U21PHZP1**
CREDITS: 3 **NO. OF HOURS/WEEK: 3**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Experiments Covered
CO1	Analyze the basic operation and the characteristics of Junction and Zener diode in various configuration and construct regulated power supply using Zener diode.	K4	6,12
CO2	Explain the characteristics features of FET and CE -Transistor.	K4	5,13
CO3	Estimate the Q-factor from frequency response of series and parallel resonance circuits.	K5	4,14
CO4	Construct and study the adder, Subtractor circuits using OPAMP IC 741, and verify the function of logic gates using discrete components.	K3	7,8,15
CO5	Determine the horizontal component of intensity of earth magnetic field and magnetic moment using Tangent galvanometer.	K5	2,10
CO6	Measure resistance, specific resistance, current, using potentiometer, Carey fosters bridge and PO box.	K4	1,3,11,16

DIGITAL ELECTRONICS AND MICROPROCESSOR LAB
FOR III B.Sc. COMPUTER SCIENCE

SEMESTER : V & VI **CODE: U21CS6P6**
CREDITS: 3 **NO. OF HOURS/WEEK:2**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Experiments Covered
CO1	Recall basics of logic gates by a universal NAND and NOR gates.	K4	3,11
CO2	Construct and study the Half Adder and Full Adder. Half Subtractor and Full Subtractor circuits.	K4	4,12
CO3	Verify the Conversion of Decimal to Hexadecimal and Hexa decimal to decimal and Block Transfer by8085 microprocessors.	K5	8,10
CO4	Develop assembly language program to perform various operations using 8085 microprocessors. µP: Multibyte µP:8-bit: addition and subtractor.	K3	7,15,16
CO5	Construct the circuit and verify the Karnaugh map reduction technique, Shift register, Up and down counter.	K5	5,6,13
CO6	Verify the Analog to Digital converter Binary weight method.	K4	14

STRUCTURE OF THE SYLLABUS

PROGRAM NAME	COURSE	COURSE CODE	COURSE NAME
M Sc Physics	Core I	P21PH101	Mathematical Physics - I
M Sc Physics	Core II	P21PH102	Classical Dynamics
M Sc Physics	Core III	P21PH103	Statistical Mechanics
M Sc Physics	Elective I	P21PH1:1	Analog and Digital Electronics
M Sc Physics	Elective I	P21PH1:A	Modern Communication System
M Sc Physics	Core Prac. I	P21PH1P1	Major Practicals - I
M Sc Physics	Core IV	P21PH204	Mathematical Physics - II
M Sc Physics	Core V	P21PH205	Electromagnetic Theory
M Sc Physics	Elective II	P21PH2:2	Atomic and Molecular Physics
M Sc Physics	Elective II	P21PH2:A	Solar PV Technology and its Application
M Sc Physics	Elective III	P21PH2:P	Virtual Labs - Physics Experiments
M Sc Physics	Core Prac. II	P21PH2P2	Major Practicals - II
M Sc Physics	Core VI	P21PH306	Quantum Mechanics - I
M Sc Physics	Core VII	P21PH307	Solid State Physics - I
M Sc Physics	Core VIII	P21PH308	Microprocessor and Microcontroller
M Sc Physics	Elective IV	P21PH3:4	Nuclear Physics
M Sc Physics	Elective IV	P21PH3:A	Radiation Physics
M Sc Physics	Core Prac. III	P21PH3P3	Major Practical - III
M Sc Physics	Core IX	P21PH309	Quantum Mechanics - II
M Sc Physics	Core X	P21PH410	Solid State Physics - II
M Sc Physics	Elective V	P21PH4:5	Crystal Growth, Thin Film and Nano Science
M Sc Physics	Elective V	P21PH4:A	Astrophysics
M Sc Physics	Core Prac. IV	P21PH4P4	Major Practical - IV
M Sc Physics	Core Project	P21PH4PJ	Project

CORE - I: MATHEMATICAL PHYSICS I

SEMESTER: I **CODE: P21PH101**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the basic concepts of vectors, vector differential calculus, vector integral calculus, vector space, matrices, differential equations and numerical techniques.	K2	I, II, III, IV, V
CO2	Apply Gauss, Stoke's and Green's Theorems for solving vector field related problems and principle of least squares for curve fitting.	K3	I, V
CO3	Determine the eigenvalues, eigenvectors, rank, inverse, power and exponential of matrices and roots of algebraic and transcendental equations using numerical techniques.	K5	II, V
CO4	Solve linear ordinary differential equations using elementary methods and partial differential equations using method of separation of variables	K3	III
CO5	Analyze the properties of Bessel, Legendre, Hermite, Laguerre, beta and gamma functions.	K4	IV
CO6	Choose the optimal numerical technique for solving integral and differential equations.	K5	V

CORE – II: CLASSICAL DYNAMICS

SEMESTER: I **CODE: P21PH102**
CREDITS: 5 **NO. OF HOURS / WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the symmetries and conservation laws of system of particles and kinematics of rigid body	K2	I,II
CO2	Solve small oscillation problem and construct canonical transformation as well as to evaluate Poisson bracket structure	K3	II,III
CO3	Analyse the planetary motion and scattering in the central force field.	K4	I
CO4	Develop Lagrangian, Hamiltonian, Hamilton-Jacobi, action-angle formulations and analyse various physical systems like simple pendulum, Atwood's machine, Kepler problem, symmetric top, etc.	K5	I, II&III
CO5	Describe the chaotic behaviour in dynamical systems and develop the methods of soliton theory.	K6	IV
CO6	Outline the special theory of relativity and examine the invariance of relativistic systems (Ex.: Maxwell's equations) under the Lorentz Transformation	K4	V

CORE -III - STATISTICAL MECHANICS

SEMESTER: I **CODE:P21PH103**

CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Analyze the consequences of the laws of thermodynamics under varied external conditions	K4	I
CO2	Enumerate the role of statistics applied to the microscopic world and establish the link between thermodynamics and statistical mechanics	K4	II, III
CO3	Construct different ensembles and deduce Maxwell Boltzmann (Classical particles), Bose Einstein and Fermi Dirac (Quantum particles) statistical distribution functions.	K5	II, III
CO4	Interpret thermodynamical quantities in terms of partition function and derive the specific heat capacities of solids	K5	II, III
CO5	Assess the behavior of ideal gas, black body, liquid helium and electron gas systems in the light of classical and quantum statistical mechanics	K5	IV
CO6	Interpret phase transitions and phase diagrams under thermodynamical equilibrium for binary systems.	K5	V

ELECTIVE- I: ANALOG AND DIGITAL ELECTRONICS

SEMESTER: I **CODE: P21PH1:1**

CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Summarize the characteristics and applications of thyristor family and MOSFET	K4	I
CO2	Examine the working of optoelectronics devices and special diodes.	K4	II
CO3	Examine the function of OPAMP as an active filter, log amplifier, clipper, clamper and 555 timer as Astablemultivibrator	K4	III
CO4	Analyse the function of different mode of shift register.	K4	IV
CO5	Develop synchronous sequential circuits.	K3	IV
CO6	Analyze the factors affecting Fiber optic communication and functioning of Microwave Devices	K5	V

ELECTIVE-I: MODERN COMMUNICATION SYSTEM

SEMESTER: I **CODE: P21PH1:A**

CREDITS:5 **NO. OF HOURS/WEEK :6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Outline the basics of noise in communication	K2	I
CO2	Classify the modulations on the basis of frequency	K3	II
CO3	Apply the concept of different type of pulse modulation in communication	K3	III
CO4	Analyze the network and controls in data communication	K4	IV
CO5	Utilize the analog and digital modulation schemes in fiber optical communication	K3	V
CO6	Explain the emitter design and detector design in fiber optical communication	K4	V

CORE IV: MATHEMATICAL PHYSICS – II

SEMESTER : II **CODE: P21PH204**

CREDITS: 5 **NO. OFHOURS/WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Apply Cauchy-Riemann conditions to test analyticity of complex function	K3	I
CO2	Evaluate the integral of complex function using Cauchy's integral theorem, Cauchy's integral formula, Cauchy's residue theorem and the solution of wave and diffusion equations using Greens function	K5	I, III
CO3	Extend the complex function using Taylor, Laurent's series and periodic function using the Fourier series and Fourier integral.	K3	I, II
CO4	Outline the types, algebra and role of tensors in physics.	K2	IV
CO5	Analyze point groups and space groups in molecular structure.	K4	V
CO6	Construct a function of a complex variable (frequency) from a function of a real variable (time) using Fourier, Laplace transforms and character tables.	K3	II, III, V

CORE-V: ELECTROMAGNETIC THEORY

SEMESTER : II **CODE: P21PH205**

CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the fundamental laws of Electrostatics, Magnetostatics and electromagnetism and rephrase them in vectoral form.	K2	I, II, III
CO2	Classify magnetic materials based on their susceptibility and organize experiments to determine the magnetic properties of magnetic materials.	K3	II
CO3	Apply various mathematical techniques to solve equations related electrostatic, magnetostatic and electromagnetic scalar and vector potentials.	K3	I,II, III
CO4	Analyze the propagation of electromagnetic waves in various medium and examine its behavior at the interface between two different media.	K4	IV,V
CO5	Design basic structures of waveguides and antennas as per the requirements.	K6	V
CO6	Evaluate the electric, magnetic and electromagnetic fields due to simple and complex structures and the energy stored in these fields.	K5	I-V

ELECTIVE- II: ATOMIC AND MOLECULAR PHYSICS

SEMESTER: II **CODE: P21PH2:2**

CREDITS: 4 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO	Course Outcomes	Level	Unit Covered
CO1	Analyze the electronic states in many electron systems and atomic spectra due to electric and magnetic field.	K4	I
CO2	Apply LCAO, Born Oppenheimer and Huckel's approximations to molecular systems.	K3	II
CO3	Examine the rotational and vibrational spectra of molecules by Microwave and Infrared spectroscopy.	K5	III
CO4	Analyze the Raman spectra of molecules using polarizability theory and Electronic spectra using Franck Condon principle.	K5	IV
CO5	Examine the nuclear interactions and relaxation effectsdue to Nuclear Magnetic Resonance and Electron Spin Resonance.	K4	V
CO6	Explain the principle and instrumentation of Microwave, Infrared, Raman, NMR and ESR spectroscopy.	K2	III,IV,V

ELECTIVE-II: SOLAR PV TECHNOLOGY AND ITS APPLICATION
SEMESTER: II **CODE: P21PH2:A**
CREDITS: 4 **NO. OF HOURS / WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Discuss the importance of renewable energy resources	K2	I
CO2	Explain the importance of Solar energy and Solar Photovoltaic system	K2	I
CO3	Apply the principles of electricity in design of solar cells	K3	II
CO4	Outline the different types of Solar Photovoltaic system, power generation, distribution and storage in solar PV systems.	K2	III
CO5	Design a solar Photovoltaic system	K5	IV
CO6	Analyse the applications and installation of a solar Photovoltaic system	K4	V

ELECTIVE - III: VIRTUAL LABS – PHYSICS EXPERIMENTS
SEMESTER: II **COURSE CODE: P21PH2:P**
CREDITS: 4 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Select remote-access to labs in various areas related to Physics	K1	I, II, III, IV, V
CO2	Perform practical in the virtual mode	K3	I, II, III, IV, V
CO3	Construct virtually, electrical and electronic circuits and validate the corresponding theorems and laws	K6	I, IV, V
CO4	Evaluate the physical parameters from tabulated data and graph	K5	IV, V
CO5	Interpret the results obtained from virtual experiment	K5	I, II, III, IV, V
CO6	Illustrate the output data in graphical mode using relevant software	K3	I, II, III

CORE VI: QUANTUM MECHANICS – I

SEMESTER: III **CODE: P21PH306**
CREDITS:5 **NO. OF HOURS /WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Recall the in adequacy of classical mechanics in the microscopic domain.	**K1**	I
CO2	Explain concepts of wave mechanics, use particle duality as a basis to formulate quantum mechanics.	**K2**	I
CO3	Construct the Schrodinger equation of microscopic physical systems on the basis of quantum mechanical interpretations and solve it.	**K3**	I & II
CO4	Analyze the dynamics of simple quantum mechanical systems by setting up the Schrodinger equations and solve them**.**	**K4**	I & II
CO5	Formulate appropriate perturbation techniques to study the behavior of simple quantum mechanical systems under perturbation of various types.	**K5**	III & IV
CO6	Assess the effects due to various perturbations**.**	**K6**	III,IV&V

CORE VII: SOLID STATE PHYSICS – I

SEMESTER : III **CODE: P21PH307**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcome	Level	Unit Covered
CO1	Infer the ideas of crystals structure and diffraction phenomenon	**K2**	**I**
CO2	Compare lattice planes, crystals vibration and structure factors	**K2**	**I,II**
CO3	Distinguish the thermal and electrical properties of semiconductor crystal	**K4**	**II**
CO4	Identifies energy levels of free electron gas	**K3**	**III**
CO5	Classify the binding and periodic potential	**K4**	**IV**
CO6	Detect imperfections in solids and effect of impurities and defects	**K5**	**V**

CORE-VIII: MICROPROCESSOR AND MICROCONTROLLER
SEMESTER : III **CODE: P21PH308**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	COURSE OUTCOMES	LEVEL	UNIT COVERED
CO1	Study and recall architecture of Microprocessor INTEL 8085	K1	I
CO2	Identify a detailed s/w & h/w structure of the Microprocessor.	K2	II
CO3	Apply how the different peripherals are interfaced with Microprocessor	K3	III
CO4	Distinguish and analyze the properties of Microprocessors &Microcontroller	K4	IV
CO5	Establish the data transfer information among different peripherals	K5	V
CO6	Evaluate their knowledge through some programs using 8085 and 8051	K6	I-IV

ELECTIVE-IV: NUCLEAR PHYSICS
SEMESTER: III **CODE: P21PH3:4**
CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the constituents and stability of nucleus, nuclear models and nuclear forces.	K2	1
CO2	Evaluate the energy released during nuclear fission and fusion reactions and study the construction of nuclear reactors.	K5	2
CO3	Explain the theory and applications of various radioactive decays.	K5	3
CO4	Categorize various principle of particle detector.	K4	3
CO5	Classify the nuclear reaction and account for its energetics.	K4	4
CO6	Analyze the elementary constituents of a nucleon based on several theories and laws of conservation.	K4	5

ELECTIVE-IV: RADIATION PHYSICS

CODE:P21PH3:A

CREDITS:5 **NO. OFHOURS/WEEK:6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Explain the fundamental concepts of atomic physics and nuclear transformation.	K2	I
CO2	Explain the different interaction mechanism of radiation with matter.	K3	II
CO3	Understand the various dosimetric quantities and concepts.	K1	III
CO4	Analyze the interaction of charged particles and radiation with matter.	K4	II & IV
CO5	Evaluate the radiation interaction with matter using radiation monitoring instruments.	K5	II,III& V
CO6	Estimate the exposure of radiation &dosimetric quantities using various radiation detecting devices/dosimeters.	K6	III & IV

CORE- IX: QUANTUM MECHANICS – II

SEMESTER: IV **CODE: P21PH409**

CREDITS: 5 **NO. OF HOURS / WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Outline the notion, Dirac, ket-bra vectors, Hilbert space and representation of operators	K2	I
CO2	Interpretthe threepictures of quantum mechanics and analyze to Linear harmonic oscillator using Heisenberg pictures	K5	I
CO3	Deducethe eigenvalue spectrum for total angular momentumand to determine theClebsch Gordon (CG) Co–efficient	K5	II
CO4	Formulate the quantum theory of identical particles	K5	III
CO5	Justify the need for relativistic quantum theory and apply it to Klein-Gordan and Dirac equations.	K5	IV
CO6	Develop the second quantization procedure for quantum fields	K6	V

CORE-X: SOLID STATE PHYSICS – II

SEMESTER: IV **CODE: P21PH410**

CREDITS: 5 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit
CO1	Explain the fundamental theories to explain the behavior of dielectric and ferroelectric materials	K2	I
CO2	Explain the properties, theories and applications of superconductors	K2	IV
CO3	Apply the band structure theory to study the optical behavior of conductors, semiconductors and insulators	K3	V
CO4	Interpret the phase changes and related properties in magnetic, ferroelectric and superconducting materials	K5	I,II&IV
CO5	Assess the temperature dependent spontaneous magnetization and dispersion relations of magnons in ferromagnetic and antiferromagnetic materials	K5	III
CO6	Analyze the origin for non-linear optical properties of materials based on crystal symmetry	K4	V

ELECTIVE-V: CRYSTAL GROWTH, THINFILMS AND NANOSCIENCE

SEMESTER: V **CODE: P21PH4:5**

CREDITS: 4 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Summarize the theory of nucleation and crystal growth.	K2	I
CO2	Explain thermodynamics and kinetics of thin film deposition process	K2	I
CO3	Classify the different crystal growth techniques and outline their principles.	K4	II
CO4	Contrast different thin film coating techniques.	K4	III
CO5	Infer the advantages and disadvantages of various synthesis techniques for nanomaterials.	K4	IV
CO6	Evaluate the physical parameters from various characterization techniques.	K5	V

ELECTIVE V: ASTROPHYSICS

SEMESTER: IV **CODE: P21PH4:A**
CREDITS: 4 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Unit Covered
CO1	Analyse the Positions of stars, Proper motions of stars and planets, All-Sky Surveys and Virtual Observatories	K4	I
CO2	Explain the Physical Processes in the solar system, Formation of Planetary Systems, Search for Extra solar Planets.	K2	II
CO3	Categorize the Spectral classification, Stellar rotation, Stellar magnetic fields, Stars with peculiar spectra.	K4	III
CO4	Infer the characteristics of Interstellar extinction and reddening.	K4	IV
CO5	Analyse the galactic magnetic field and cosmic rays.	K4	IV
CO6	Estimate the kinematics, expansion of the Universe, active galaxies, clusters of galaxies.	K6	V

MAJOR PRACTICALS - I

SEMESTER: I **CODE: P21PH1P1**
CREDITS: 3 **NO. OF HOURS/WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Experiments Covered
CO1	Observe and study the mechanical, optical, thermal, magnetic, dielectric, electrical and electronic properties of various materials.	K2 &K3	1,2,3,4,5 & 6
CO2	Understand and explain various properties of materials and the modern equipment's used for investigation of the same.	K2&K3	
CO3	Determine and describe certain constants and coefficients and other properties of the various materials.	K3 &K4	7,8 &9
CO4	Analyze, Discuss, Calculate and Compare some properties at large and other related properties of the materials using various means and methods.	K3 &K4	10
CO5	Operate and optimize various mechanical, electrical, electronic and other modern equipment's used for characteristic analysis of materials.	K4&K5	11, 12, 13 & 14
CO6	Apply the various concepts learned to Design modern equipment's to perform characteristic analysis of materials and to support the Research and Development.	K6	15, 16, 17 & 18

MAJOR PRACTICAL – II

SEMESTER: II **CODE: P21PH2P2**
CREDITS: 3 **NO. OF HOURS/ WEEK: 6**

At the end of this course, the students will be able to

CO.NO.	Course Outcomes	Level	Experiment covered
CO1	Test the charge and mass ratio using various experimental methods.	K2	1,2,5,6
CO2	Construct the circuits and verify characteristics of given electronic components.	K3	1-16
CO3	Examine the function of semiconductor switching devices (Thyristors).	K4	15,16,17
CO4	Measure Young's modulus, Numerical aperture, Thermal conductivity and energy loss of various materials.	K5	1-7, 14
CO5	Determine physical constants such as specific charge of electron, Stefan's constant and Planck's constant.	K5	3, 5, 6,7
CO6	Construct amplifier, oscillator circuits and analyze their frequency responses.	K6	8, 9, 10, 11, 12, 13, 18

MAJOR PRACTICAL– III

SEMESTER: III **CODE: P21PH3P3**
CREDITS: 3 **NO. OF HOURS /WEEK:6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Experiment Covered
CO1	Construct the OPAMP circuits and study characteristics and responses of circuits.	K3	1,2,3,4,5.
CO2	Apply the concepts of operational amplifier to solve differential and simultaneous equations.	K2	6
CO3	Construct the circuits and verify the characteristics of non-linearity and modulation -demodulation.	K4	7,8,9,10
CO4	Make use of light to determine the physical properties of materials, Measure dielectric properties of solid and liquid materials.	K5	11,12,13,14.
CO5	Develop thin film and study the physical properties of prepared materials.	K5	15,16,17
CO6	Determine magnetic properties of materials.	K5	18,19

MAJOR PRACTICAL– IV

SEMESTER: IV **CODE: P16PH4P4**
CREDITS: 3 **NO OF HOURS /WEEK: 6**

At the end of this course, the students will be able to

CO. NO.	Course Outcomes	Level	Experiments covered
CO1	Examine the functionalities of basic combinational circuits.	**K4**	**1,2,3,4**
CO2	Make use of basic sequential circuits using Flip-flop.	**K3**	**5,6,7**
CO3	Construct logic circuits and simplify the Boolean expression.	**K5**	**8,9,10**
CO4	Test and debug ALP using microprocessor (8085) and microcontroller (MCS51) systems	**K4**	**11,12**
CO5	Interface various A/D, D/A convertor, Traffic light controller and Stepper motor controller.	**K5**	**13,14,15, 16,17**
CO6	Make use of numerical methods to the application of physics (RK2, RK4, Newton-Rapson) and C Programming and plotting the data using Origin.	**K5**	**18,19,20**