



*Ready for
Every Good Work*

SACRED HEART COLLEGE (AUTONOMOUS)

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A Don Bosco Institution of Higher Education, Founded in 1951 * Affiliated to Thiruvalluvar University, Vellore * Autonomous since 1987

Accredited by NAAC (4th Cycle – under RAF) with CGPA of 3.31 / 4 at 'A+' Grade

Name of the Programme: B.Sc. Physics

S No	Title of the Paper	Course Code	Course Objectives	Course Outcomes	Relevance
1	MECHANICS	P113	<ul style="list-style-type: none"> To impart knowledge on concepts of Centre of gravity, Projectiles, Circular motion, Impact and Dynamics of rigid bodies. To learn the method of determining the centre of gravity of objects. To understand the projectile motion up and down an inclined plane. To learn the concept of Moment of inertia and the method of determining the Moment of Inertia of compound pendulum. To make the students to understand the basic concepts of Hydrostatics and Hydrodynamics. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Differentiate between centre of mass and centre of gravity of objects and will be able to determine the Center of gravity of spheres and cones. Apply the knowledge of circular motion to explain the concept of banking of curves. State the laws of impact and Assess the loss of K.E. due to direct and oblique impact of two smooth spheres. Determine the M.I. of solid sphere and spherical shell about a diameter and the M.I. of a compound pendulum about an axis through its centre of gravity. Derive Euler's equation and elucidate Bernoulli's theorem. Solve simple problems related to circular motion, projectiles, Impact and Rotational motion of rigid bodies. 	National developmental needs

2	PROPERTIES OF MATTER	P114	<ul style="list-style-type: none"> • To impart knowledge on Elasticity, Moduli of elasticity, relation between elastic constants and the methods of determining rigidity modulus of material of objects. • To learn, understand and determine the Young's modulus of material of objects. • To learn about the concept of Viscosity and understand the Poiseuille's method and Searle's method of determining the viscosity of liquids. • To comprehend the concept of Surface tension and evaluate the surface tension and interfacial surface tension of liquids by drop weight method. • To learn and understand the concepts of osmosis and diffusion and their applications. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Have an understanding of basic concepts of Elasticity and will be able to determine the rigidity modulus of materials in the form of wire or rod. • Evaluate the work done in stretching and twisting a wire and determine the rigidity modulus of materials in the form of wire and rod. • Determine the viscosity of liquids by Poiseuille's method and Searle's method and explain the theory behind the method. • Evaluate the surface tension and interfacial surface tension of liquids by drop weight method. • Distinguish between osmosis and diffusion and explain the methods of determining osmotic pressure and rate of diffusion of fluids. 	National developmental needs
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3	HEAT AND THERMODYNAMICS	P212	<ul style="list-style-type: none"> • To learn basic concepts of calorimetry, CP and CV of a gas, Vanderwaal's equation of state and derive expressions for critical constants in terms of Vanderwaal's constants. • To define coefficient of thermal conductivity of a material and describe experimental methods for determining thermal conductivity of a good and a bad conductor. • To learn about Planck's quantum theory of radiation and interpret energy distribution in the spectrum of a black body radiation. • To study Boltzmann's Law of equipartition of energy and apply it to find the specific heat capacity of mono atomic and diatomic gases. • To learn and understand Joule Thomson effect, explain the different methods of producing low temperature and liquefaction of Hydrogen and Helium. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Distinguish between thermal capacity and specific heat capacity, CP and CV of a gas. They will be able to develop Vanderwaal's equation of state and derive expressions for critical constants in terms of Vanderwaal's constants. • Define coefficient of thermal conductivity of a material and describe experimental methods for determining thermal conductivity of a good and a bad conductor. • Explain Planck's quantum theory of radiation and interpret energy distribution in the spectrum of a black body radiation. • Explain Boltzmann's Law of equipartition of energy and apply it to find the specific heat capacity of mono atomic and diatomic gases. • Describe Joule Thomson effect, explain the different methods of producing low temperature and liquefaction of Hydrogen and Helium. 	<p>National developmental needs</p>
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			<ul style="list-style-type: none"> To learn laws of thermodynamics, explain the working of Otto engine, define thermodynamic potentials, derive Maxwell's relations and deduce Clausius-Clapeyron Equation. 	<ul style="list-style-type: none"> State the laws of thermodynamics, explain the working of Otto engine, define thermodynamic potentials, derive Maxwell's relations and deduce Clausius-Clapeyron Equation. 	
4	WAVES AND OSCILLATIONS	P213	<ul style="list-style-type: none"> To introduce the concepts of waves, wave motion, interference of sound waves, Beats To introduce the concept of interference of sound waves and beats. To understand SHM, Lissajous figures and the concepts related to them. To comprehend the concepts of damped vibrations, forced vibrations and resonance To acquire knowledge on the production, detection and applications of ultrasonic waves. To provide a better understanding of factors affecting acoustics of buildings 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Explain the different types of waves and derive expressions for plane progressive waves and energy of progressive waves. Distinguish between progressive and stationary waves, derive expressions for stationary waves and energy of stationary waves, explain the concept of beats and apply their knowledge on beats to estimate the frequency of sound waves. Explain Simple Harmonic Motion, derive expression for the resultant motion of a particle subjected to two SHMs of equal periods acting at right angles to each other and predict the shape of the curve traced by the particle. Define, differentiate and derive expressions for free, damped and forced vibrations and determine 	National developmental needs

				<p>the frequency of a.c. using sonometer.</p> <ul style="list-style-type: none"> • Define reverberation time, summarize the factors affecting acoustics of buildings and suggest ways to improve acoustics of buildings. • Enumerate the production, detection and applications of ultrasonic waves. 	
5	PHYSICS MAIN PRACTICAL'S – I	PP207	<ul style="list-style-type: none"> • To determine the Young's modulus of materials in the form of a beam. • To calibrate voltmeter and ammeter using potentiometer. • To determine the viscosity and surfacetension of liquids. • To learn the usage of spectrometer and to determine the refractive index of material of a prism.. • To construct basic logic gates using discrete components and verify their truth tables. • To construct low range power pack and stabilized power supply circuits and measure their outputs 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Acquire laboratory skills/practical skills, a capacity for self management and teamwork,. They will be able to handle optical, electrical and electronic instruments effectively to take measurements/observations. • Develop analytical and scientific reasoning skills. They will be able to analyze the measurements/observations to draw valid conclusions. • Determine the Young's modulus of materials in the form of beam, the rigidity modulus of materials in the form of wire, Viscosity, surface tension and Interfacial surface tension of liquids and recall the theory behind the 	Regional & National developmental needs

				<p>experiments.</p> <ul style="list-style-type: none"> • State the laws of transverse vibration of strings and measure the frequency of tuning forks and ac using sonometer. • Determine the focal length of convex and concave lenses, measure the refractive index of material of a prism using spectrometer and estimate the thickness of a thin wire by forming air wedge. • Design experiment to study the characteristics of Zener diode, construct stabilized power supply using zener diode, construct basic logic gates using diodes and transistor and examine their operation. 	
6	ALLIED PHYSICS FOR MATHEMATICS-I	AP105A	<ul style="list-style-type: none"> • To develop an understanding of basic concepts of mechanics, elasticity, viscosity, surface tension, heat and optics. • To study the elastic behavior of the solids and viscosity of the liquids • To comprehend and learn the concepts of heat and heat transmission 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Distinguish between centre of mass and centre of gravity of objects, state the laws of impact and calculate the loss of kinetic energy due to direct impact of smooth spheres. 	National developmental needs

			<ul style="list-style-type: none"> To understand the concepts of interference and polarization of light waves and their applications. 	<ul style="list-style-type: none"> Determine the Young's modulus of materials in the form of rod and rigidity modulus of material in the form of wire and explain the theory behind the experiments. Define and measure the viscosity and the surface tension of liquids Distinguish between CP and CV of a gas, describe experiments to measure the value of Cp and CV of gas, thermal conductivity of poor conductors and different methods of producing low temperature. Differentiate between Spherical aberration and chromatic aberration in lenses, suggest ways to minimize them. Explain interference and polarization of light and perform experiment to determine the thickness of a thin wire by forming air wedge. 	
7	ALLIED PHYSICS FOR MATHEMATICS-II	AP205	<ul style="list-style-type: none"> To understand the working principle of Lasers and their applications To study the different types of optical fibers and its applications To understand the properties of ultrasonics and its applications 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Explain working principle of lasers and describe the applications of Lasers and Optical fibers. 	National developmental needs

			<ul style="list-style-type: none"> • To study the critical potential and quantum numbers associated with the vector atom model. • To study the process of artificial transmutation, radio isotopes and their applications, working of accelerators. • To study the fundamentals of electrical and electronic devices and circuits. 	<ul style="list-style-type: none"> • Define SHM and derive expression for the resultant motion of a particle subjected to two SHMs acting at right angles. • State laws of transverse vibration of strings, determine the frequency of AC using a Sonometer and describe methods of production and detection of ultrasonics. • Specify and explain the Quantum numbers associated with the vector atom model, state the laws of Photoelectric effect and derive Einstein's photoelectric equation. • Determine the value of a resistor from its colour coding, explain the growth and decay of current in a circuit containing resistance and inductance and design an experiment to calibrate a low range voltmeter. • Construct two inputs AND, OR gates using diodes and NOT gate using Transistor, examine their operation and evaluate their performance, 	
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8	ELECTRICITY AND MAGNETISM	P312	<ul style="list-style-type: none"> • To introduce to the students the basic concepts of Electrostatics • To make the students understand concepts on working and applications of capacitors and electrometers • To explain the principle and working of Potentiometer and Carey Foster's Bridge. Also to understand the working of LCR and resonance circuits. • To provide an overview of the fundamental principles of Coulomb's law, Biot-Savart law and magnetostatics. • To make the students understand the various types of magnetism. 	<p>On successful completion of course, the students will be able to</p> <ul style="list-style-type: none"> • Explain and differentiate between electric field and electric potential and also illustrate the coulomb's law and its applications • Understand the functions and the basic principles of capacitors and electrometers. • Explain the working principle of Carey-Foster bridge and Potentiometer and apply their knowledge to set up experiments in the laboratory. • State and explain various laws of magnetostatics and illustrate their applications. • Compare the properties of Dia, Para and Ferro magnetic materials and identify the form of magnetism possessed by a material 	Regional & National developmental needs
9	OPTICS	P313	<ul style="list-style-type: none"> • To impart the knowledge on angular dispersion produced by prism, aberrations in lenses and methods of minimizing them in thin lenses. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Differentiate the various aberrations in lenses and describe different methods of minimizing them. 	Regional & National developmental needs

			<ul style="list-style-type: none"> To understand the basic phenomena of interference and determination of thickness of a thin wire and refractive index of medium by using various interference experiments To explain the diffraction of light and classify Fresnel's and Fraunhofer diffraction with illustration of necessary theory and experiments. To Illustrate the polarization of light waves, their types and explain the various optical activity produced when the light passing through the crystal. To apply the LASER/MASER action produced in the material; analyze the principle, working mechanism and applications. 	<ul style="list-style-type: none"> Explain the phenomenon of interference and illustrate interference experiments to find the thickness of a thin wire and refractive index of medium Exemplify the diffraction of light and compare the Fresnel's and Fraunhofer diffraction of light with an illustrative diffraction experiments Compare the different types of polarization of light waves and analyze the optical characteristics when the light is passing through the crystals State the principle of LASER/MASER action in materials and set up experiments to demonstrate the working mechanism of CO₂ and semiconductor lasers 	
10	MODERN PHYSICS	P414	<ul style="list-style-type: none"> To gain knowledge about positive rays and mass spectrographs. To acquire knowledge about magnetic dipole moment due to orbital and spin motions of electron. To study and understand Zeeman effect and Paschen-Back effect. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Differentiate between Positive rays and cathode rays and explain the working principle of different mass spectrographs. 	National developmental needs

			<ul style="list-style-type: none"> To gain knowledge about electronic spectroscopy. To review the fundamental concepts of vibrational spectroscopy. 	<ul style="list-style-type: none"> List and explain the various quantum numbers associated with electrons and distinguish between LS coupling and jj coupling in atoms Differentiate between Zeeman effect and Anomalous Zeeman effect and explain Paschen-Back effect. Understand the interaction of electromagnetic radiation with matter, state the basic laws of absorption and transmission of radiation and outline the principle involved in UV-Visible spectroscopic technique. Acquire a knowledge on Vibrational spectroscopy, inspect the functional groups in compounds using IR spectroscopy and Compare IR and Raman spectroscopy. 	
11	ELECTROMAGNETISM	P415	<ul style="list-style-type: none"> To impart knowledge on concepts of Electromagnetic induction To make students understand the concept of self-inductance 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> State Faraday's laws of Electromagnetic induction and estimate the emf induced in a Rectangular loop of wire moving through a non uniform magnetic field 	National developmental needs

			<ul style="list-style-type: none"> • To understand the working principle of Ballistic galvanometer and its applications • To learn the principle and working of earth inductor and A.C generator • To apply Maxwell's equations to discuss the propagation of electromagnetic waves in free space. 	<ul style="list-style-type: none"> • Explain self-induction and its physical significances and design Anderson bridge to determine the self inductance of an inductor using. • Understand and apply the principle of B.G. to determine the mutual inductance between pair of coils • Outline the principle, working and applications of Earth inductor, Search coil and A.C. Generator • Explain the significance of Maxwell's equations in free space and apply it to electromagnetic waves in isotropic non-conducting media. 	
12	PHYSICS MAIN PRACTICALS – II	PP413	<ul style="list-style-type: none"> • To determine the Young's modulus of materials in the form of a beam by subjecting them to Uniform and Nonuniform bending. • To calibrate voltmeter and ammeter using potentiometer. • To determine the viscosity and surfacetension of liquids. • To learn the usage of spectrometer and to determine the wavelength of spectral lines. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Use the spectrometer to estimate the wavelength of spectral lines and the refractive index of materials • Inspect the effective usage of Potentiometers, Carey Foster's bridge and BG • Describe the working of microscope and the telescope and use them effectively 	Regional & National developmental needs

			<ul style="list-style-type: none"> To verify the logic functions of basic logic gates and design arithmetic circuits using discrete components and ICs. To construct analog dual power supply and voltage stabilization circuits and measure their outputs. 	<ul style="list-style-type: none"> Recall the logic functions of basic logic gates and design arithmetic circuits using discrete components and ICs Construct analog dual power supply circuits and voltage stabilization circuits and measure their outputs 	
13	ALLIED PHYSICS FOR CHEMISTRY – I	AP309A	<ul style="list-style-type: none"> To study the basics of elasticity and its importance in beams. To study the concepts of viscosity and the various methods to determine the parameters experimentally. To understand the concepts behind thermodynamics and thermodynamic laws. To study the propagation of sound waves, the production of ultrasonic waves, Acoustics and their applications. To distinguish the geometrical and physical optics. To understand the concept of basic electronics and digital electronics 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Acquire basic knowledge about elasticity and viscosity of liquids and measure the viscosity of liquids by Poiseuille’s method. State and explain different laws of thermodynamics and distinguish between adiabatic and isothermal changes. Apply the laws of transverse vibrations to estimate the AC frequency using sonometer, describe the production and applications of Ultrasonic waves and recommend the conditions for good acoustics of auditoriums. Comprehend the concepts of spherical aberration, chromatic aberration and the methods of minimizing them and interference of light. 	National developmental needs

				<ul style="list-style-type: none"> Construct rectifiers and voltage regulators using diodes and explain the logic functions of basic logic gates. 	
14	<p align="center">ALLIED PHYSICS FOR CHEMISTRY -II</p>	AP309B	<ul style="list-style-type: none"> To study the basic ideas of electricity and magnetism To study vector atom model and to determine the methods of critical potential To study the structure of the alkali spectral lines To study the basics of nuclear reactions, process of radioactivity and its applications To understand the concepts of wave mechanics and dualistic nature of light To study the different methods of preparing thin films, nanomaterials and their applications 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Describe the growth and decay of current in DC circuits, design experiments to calibrate ammeter and voltmeter using potentiometer and distinguish dia, para, and ferromagnetic materials. Explain the various quantum numbers associated with the vector atom model. Illustrate a knowledge on the basics of nuclear reactions, radioactivity and classification of elementary particles and estimate the amount of energy released in nuclear reactions. State and explain the concepts of matter waves, Heisenberg's uncertainty principle and laws of photo electric effect. Describe various methods of thin films and Nanomaterials preparation and state the applications of nanomaterials. 	<p>National developmental needs</p>

15	ALLIED PHYSICS PRACTICALS FOR CHEMISTRY	PAP409 A	<ul style="list-style-type: none"> • To perform experiments on elasticity of materials and viscosity of liquids • To demonstrate an experiment to determine the frequency of ac mains • To perform experiments on interference of light waves and its applications. • To do calibration of voltmeter and ammeter using potentiometer • To design simple analog and digital electronic circuits. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Apply their knowledge on properties of matter to perform experiments to determine the Young's modulus and Rigidity modulus of materials and viscosity of liquids • Perform an experiment to determine the frequency of ac mains using sonometer and analyze the result obtained. • Set up Newton's rings and air wedge experiments and apply their knowledge on interference of light waves to determine the refractive index of material of a lens and thickness of a wire. • Use potentiometer to calibrate low range voltmeter and high range ammeter and explain the principle behind the experiment. • Recall the logic function of different logic gates and employ them to construct simple electronic circuits. 	Regional & National developmental needs
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16	ALLIED PHYSICS FOR COMPUTER SCIENCE –I	AP309B	<ul style="list-style-type: none"> • To make the students to explore the Physics in active devices and also to introduce the concept of semiconductors and their working principles • To explore the principles and applications of passive devices. • To understand the series and parallel circuits and their short and open circuits in real time applications. • To induce the minds of the students to understand the principle and applications of LASER in science and technology. • To make the students the importance of the optical fiber communication, LED, Photoresistor and solar cell. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Analyse the functions of active devices especially diodes and transistors. • Calculate the values of resistors and capacitors from the colour coding and understand the importance of the passive devices in everyday life. • Identify the short and open circuits in complex circuits which consist of series and parallel components. • Realize the importance of LASER in modern science and technology. • Understand the working principle of fiber optic cable, LED, LCD, photoresistor and solar cell. 	Regional & National developmental needs
17	ALLIED PHYSICS FOR COMPUTER SCIENCE – II	AP409B	<ul style="list-style-type: none"> • To introduce the fundamental concepts and working principles of various semiconductor devices and their applications. • To introduce the basic concepts of operational amplifier and its various applications. • To familiarize the switching characteristics of transistor, various multivibrators, applications of diode as 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Understand the working principle of JFET and design rectifier circuits. • Apply knowledge on op-amp to design and analyze various applications of op-amps. • Understand the working of multivibrators and design wave shaping circuits. 	Regional & National developmental needs

			<p>integrator, differentiator, clipper and clamper.</p> <ul style="list-style-type: none"> To familiarize with the different number systems and combinational circuits utilized in the digital circuits. To study the working of various flip-flops, registers, counters and their applications. 	<ul style="list-style-type: none"> Gain knowledge of different types of number systems and their mutual conversions, State and prove DE Morgan's theorems and Explain the working principle of combinational circuits. Construct and evaluate the performance of flip-flops, registers and counters. 	
18	ALLIED PHYSICS PRACTICALS FOR COMPUTER SCIENCE	PAP409 B	<ul style="list-style-type: none"> To have an hands on training to handle the electronic components and bread board To construct the logic circuits and demonstrate the output by truth tables To realize the importance of calibration of voltmeter and galvanometer To verify the theorems and Physics laws using passive and active devices To construct stabilized power supply by them self 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Handle the electronic components for constructing electronic circuits. Construct logic gate circuits. Calibrate voltmeter and galvanometer. Verify the Physics laws especially Ohms law and De Morgan's theorem. Construct stabilized power supply. 	Regional & National developmental needs
19	CLASSICAL MECHANICS AND STATISTICAL PHYSICS	P534	<ul style="list-style-type: none"> To revise Newtonian mechanics and introduce Lagrangian formulation of mechanics. To learn Hamilton's principle and Hamiltonian formulation of mechanics. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Identify the motion of mechanical systems and apply the Lagrangian formalism to generate equations of motion for them. 	National developmental needs

			<ul style="list-style-type: none"> • To realize the reduction of a two-body problem to a one-body problem in a central force system. • To understand the properties of macroscopic systems using the knowledge of the properties of individual particles. • To know about classical and quantum statistics and their applications. 	<ul style="list-style-type: none"> • Apply the knowledge of Hamilton's principle to solve physical problems, including simple pendulum, compound pendulum, linear harmonic oscillator. • Determine the differential equation of orbit, stability of orbit under central force field • Understand concepts of statistical mechanics and find the connection between statistics and thermodynamics • Differentiate between classical statistics and quantum statistics • Solve some problems like monoatomic gas, photon gas and electron gas and find the energy distribution of them using statistical distribution laws. 	
20	SEMICONDUCTOR DEVICES AND THEIR APPLICATIONS	P535	<ul style="list-style-type: none"> • To introduce diodes and their types along with their applications • To provide an overview of the principles, operation and applications of FET, MOSFET, UJT and SCR. • To Provide an overview of small signal and large signal amplifiers. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • explain the implications of characteristics of various types of diodes and different rectification process. • acquiring knowledge on Fabrication of a transistor, JFET, MOSFET, UJT and SCR 	Regional & National developmental needs

			<ul style="list-style-type: none"> • To Inculcating basic concepts about oscillators, their construction and working. • To introducean operational amplifier and their linear and non-linear applications. 	<ul style="list-style-type: none"> • demonstrate the basic concept behind the working of a transistor amplifier, and able to explain the working of R-C coupled amplifier and calculate the gain of multistage amplifiers. • demonstrate the basic concept behind the working of anoscillator and multivibrators. • solving various mathematical operations like summing, difference, integrators, differentiators, sign changersetc.,using operational amplifier 	
21	SOLID STATE PHYSICS	P536	<ul style="list-style-type: none"> • To impart knowledge on crystalline and amorphous substances, reciprocal lattice, cubic crystal structures, and X-ray diffraction. • To analyse and understand the lattice vibrations and to learn Einstein and Debye theories of specific heat of solids. • To understand various types of magnetic materials and to learn, their theories. • To learn about dielectric materials, their properties and applications. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Differentiate between crystalline and amorphous materials, understand the concept of reciprocal lattice, compare different crystal structures and the explain x-ray diffraction. • Comprehend lattice vibrations and apply it to explain Einstein and Debye theories of specific heat of solids. • Discriminate between various types of magnetic materials and formulate theories to explain the origin of magnetic properties. 	National developmental needs

			<ul style="list-style-type: none"> To understand the basic concept of band theory of solids, classifications of solids based on band gap and explain superconductivity. 	<ul style="list-style-type: none"> Describe polarization mechanism and outline theories of polarization. Understand the basic concepts of band theory of solids, classify solids based on band gap and explain the phenomenon of superconductivity. 	
22	MATHEMATICAL PHYSICS	P537	<ul style="list-style-type: none"> To develop an understanding of vector differentiation and vector integration. To make the students familiarize with orthogonal curvilinear coordinates and vector spaces. To understand the Beta, Gamma and Dirac–Delta function. To impart the basic knowledge on Fourier series and its Applications. To familiarize partial differential equations and the applications of partial differential equations. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Acquire a knowledge of vector differentiation and vector integration and will be able to apply their knowledge to solve problems in vector differentiation and vector integration. Understand the concepts of orthogonal curvilinear coordinates, linear independence, basis and dimension and apply these concepts to various vector spaces and subspaces. Understand, analyze and solve problems on beta, gamma and Dirac delta functions. Comprehend and explain Fourier series, enumerate its importance and applications in physics. Evaluate higher order partial differential equations by the method of separation of variables. 	National developmental needs

23	<p style="text-align: center;">SUBJECT ELECTIVE I: NANOMATERIALS AND THEIR APPLICATIONS</p>	P538A	<ul style="list-style-type: none"> • To know the fundamentals of nanotechnology. • To learn about various physical methods to synthesis nanomaterials. • To familiarize the students regarding the preparation of nanomaterial by different chemical methods. • To acquaint the importance of carbon and their various forms. • To develop an understanding among students about the various applications of nanotechnology. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • explain the origin and emergence of nanotechnology and also able to relate different nanostructures with each other. • summarize and compare the electrical, vibrational and mechanical properties of nanomaterials • prepare the nanomaterials by various physical and chemical methods. • classify and compare carbon nanostructures and their properties. • summarize the importance of nanomaterials and evaluate its applications in different fields. 	<p>National developmental needs</p>
24	<p style="text-align: center;">SUBJECT ELECTIVE – I: ELECTRONIC COMMUNICATION SYSTEMS</p>	P538B	<ul style="list-style-type: none"> • To provide a knowledge on fundamentals of electronic communication, electromagnetic spectrum and its applications. • To learn about the principles of various analog and digital modulation techniques. • To impart knowledge on cellular communication system and recent advances in mobile communication systems. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Understand the fundamentals of electronic communication, distinguish different regions of electromagnetic spectrum and describe their applications. • Compare different modulation techniques and appraise their advantages and importance. 	<p>National developmental needs</p>

			<ul style="list-style-type: none"> To make the students to understand the principles involved in fiber optic communication system and radar. To explore the roles of microwaves and Satellites in electronic communication 	<ul style="list-style-type: none"> explain the operation of cellular communication system and compare GSM and CDMA. Demonstrate their knowledge on fiber optic combination system and describe the working of radar and its applications. understand and formulate the role of microwaves and satellites in electronic communication. 	
25	SUBJECT ELECTIVE - I: RENEWABLE ENERGY AND ENERGY HARVESTING	P538C	<ul style="list-style-type: none"> To make the students to understand the importance of fossil fuels, conventional energy resources. To provide a complete idea of basic components of a typical solar collectors and its applications in the solar energy absorption equipment's. To make the students to analyze the dissimilarity between Horizontal axis and vertical axis WECS. To enable the students to comprehend the concept behind various energy sources including biomass, tidal energy and hydrogen energy. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Explain the basic ideas on commercial and non-conventional energy resources and illustrate their availability. Explain the construction and designing of solar collectors and its implementation in the solar energy equipments. Demonstrate the variance in the operation of vertical axis and horizontal axis WECS and its installation towards power production. Infer the knowledge on various energy sources including ocean, tidal and biomass conversion technologies. 	Regional & National developmental needs

			<ul style="list-style-type: none"> To give a basic knowledge about various methods of energy harnessing, storage systems and distribution. 	<ul style="list-style-type: none"> Realize the need of energy harvesting and describe the methods of storage systems to achieve the sustainability in the energy sector. 	
26	SUBJECT ELECTIVE: PROGRAMMING IN C	P539A	<ul style="list-style-type: none"> To introduce the students to the basic concepts of C program To enable the students to understand the different types of operators, I/O functions, and their usage in writing programs To create the skill to write and execute simple C programs with control statements To learn to use functions in C programs and to solve problems. To know about the different kind of arrays and their usage to solve arithmetic problems. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Differentiate between C tokens, keywords and identifiers Declare and Initialize variables in C program Understand the concept of operators and I/O functions and use them effectively in C program Write and execute simple programs using control statements Define a function and apply code reusability with functions Classify the arrays, write programs with arrays, perform pointer arithmetic, and use the pre-processor. 	National developmental needs
27	SUBJECT ELECTIVE II: 8085 MICROPROCESSOR AND ITS APPLICATIONS	P539B	<ul style="list-style-type: none"> To introduce different number systems and their mutual conversions. To familiarize the students with the architecture of 8085 microprocessor and its interrupts. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Explain the different number systems and also recognize their mutual conversion methods. Describe the architecture and interrupts of 8085 microprocessor with neat sketch. 	National developmental needs

			<ul style="list-style-type: none"> • To understand the instruction set and addressing modes of 8085 microprocessor. • To learn methods of interfacing memory with 8085 microprocessor. • To develop assembly language program writing skills. 	<ul style="list-style-type: none"> • Classify the different instructions and also explain the different addressing modes of 8085 microprocessor. • Understand and explain the basic concepts of memory interfacing and I/O interfacing with 8085 microprocessor. • Apply their knowledge to write simple assembly language programs for 8085 microprocessor. 	
28	SUBJECT ELECTIVE II: MEDICAL PHYSICS	P539C	<ul style="list-style-type: none"> • To provide a knowledge on the physics principles involved in the pressure system, optical system, dynamics of human body and acoustics of human body. • To understand radiation exposure and its measurement and the working mechanism of different radiation detectors. • To learn the principles and instrumentation involved in various diagnostic systems. • To enable the students to understand the principle, instrumentation and working of biological imaging systems. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Explain and differentiate the various physics principles involved in the dynamics of human body and in the pressure system, optical system, and acoustics of human body. • understand and distinguish the various units used in radiation exposure measurement and describe the working mechanism of different radiation detectors. • Demonstrate an understanding of working principle and instrumentation of various diagnostic systems. 	Regional & National developmental needs

			<ul style="list-style-type: none"> To create awareness on radiation hazards and protection against radiation hazards. 	<ul style="list-style-type: none"> understand the principle, instrumentation and working of biological imaging systems and evaluate their merits and demerits. Describe various radiation hazards and design equipment for protection against radiation hazards. 	
29	ASTROPHYSICS	P720C	<ul style="list-style-type: none"> To introduce the students to universe and its evaluation. To impart knowledge on galaxies and its types. To understand the basic structure and properties of milky way galaxy. To provide an overview of solar system. To learn methods of estimating astronomical distances and temperature and radius of stars 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Understand and explain the origin of Universe and predict the present age of the universe. Describe the classification of galaxies. Acquire basic knowledge of milky way galaxy and its properties. Explain the Solar system and its origin. Estimate astronomical distances and temperature and radius of stars. 	Regional & National developmental needs
30	SELF STUDY: LASER PHYSICS AND FIBER OPTICS	P541SP1	<ul style="list-style-type: none"> To introduce the students to the basic principles of LASER. To provide a knowledge on various types of LASERs. To enhance the knowledge of different applications of LASER in Material Processing and Electronics Industry. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Explain the basic principle of Laser emission. Examine the working principle and design considerations of various lasers. Outline the applications of laser in industries. 	Regional & National developmental needs

			<ul style="list-style-type: none"> To familiarize the applications of LASERS in Nuclear Energy and medicine. To provide an opportunity for the students to learn about Optical fibres and Optical fibre communication system. 	<ul style="list-style-type: none"> Gain knowledge on applications of Lasers in fields such as Nuclear Energy, Medicine and Surgery. Comprehend the significance of optical fibre communication system. 	
31	APPLIED ELECTRONICS	P631	<ul style="list-style-type: none"> To learn about basic logic gates, DeMorgan's theorems, Simplification of Boolean expressions and implementation of logic circuits using NAND-NAND logic. To learn design, working and truth table of combinational circuits. To study about different logic families and flip flops. To understand the working of Shift registers, Asynchronous counters and Synchronous counters. To study about the different types of ADC and DAC and the architecture and applications of timer IC 555. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Simplify Boolean expressions using K-map and design NAND-NAND logic circuits. Construct arithmetic circuits and explain their operation. Compare different logic families and explain the working of various flip flops. Acquire a knowledge on Shift registers and counters and construct different Modulus counters. Explain the working of different types of ADC and DAC and predict their output voltage and describe the architecture and applications of timer IC 555. 	Regional & National developmental needs
32	NUCLEAR AND PARTICLE PHYSICS	P362	<ul style="list-style-type: none"> To introduce to the basic properties of nucleus and different nuclear models. To study about different types of radiation detectors, 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> explain the properties of nucleus, different nuclear models and their predictions. 	National developmental needs

			<p>radioactivity and particle accelerators.</p> <ul style="list-style-type: none"> • To understand the different types of nuclear reactions and radioactivity. • To learn about fission, fusion and different types of nuclear reactors. • To provide an overview of elementary particles and their interactions 	<ul style="list-style-type: none"> • different types of radiation detectors and particle accelerators. • demonstrate an understanding of the different types of nuclear reactions and radioactivity. • Distinguish between nuclear fission and fusion, estimate the energy released in Nuclear reactions and compare different types of nuclear reactors. • Acquire a knowledge of elementary particles and their interactions. 	
33	<p>QUANTUM MECHANICS AND RELATIVITY</p>	P633	<ul style="list-style-type: none"> • To introduce the concepts of Matter waves and Heisenberg's uncertainty principle. • To learn the postulates of quantum mechanics, Schrodinger equations and Ehrenfest theorem. • To understand the applications of Schrodinger equations. • To study Galilean and Lorentz transformation equations and their applications. • To provide an understanding on the relativistic variation of mass with velocity and postulates of general theory of relativity. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Understand the concepts of Matter waves, estimate the de-Broglie's wave length of electrons and explain Heisenberg's uncertainty principle. • Distinguish between time dependent and time independent Schrodinger equations and apply Linear, momentum and energy operators. • Describe the basic principles of quantum mechanics and explain operator formulation of quantum mechanics. 	<p>National developmental needs</p>

				<ul style="list-style-type: none"> • Explain the concepts of frame of reference and inertial frames and state the fundamental postulates of Special theory of relativity. • State the postulates of General theory of relativity and enumerate its applications. 	
34	PHYSICS MAIN PRACTICALS – III (GENERAL EXPERIMENTS)	PP615	<ul style="list-style-type: none"> • To familiarize the students with physics concepts and experiments. • To acquaint the importance of practical experiments to students. • To develop an understanding among students about conversion of a galvanometer into voltmeter and ammeters. • To train the students in handling physics experiments. • To facilitate the students for handling spectrometer and B.G experiments. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Design a circuit to convert a galvanometer into voltmeter and ammeter with desired calibration. • Apply the knowledge on potentiometer to estimate the EMF of a thermocouple. • Estimate the value of g using compound pendulum. • Recall the concept of Young's modulus and evaluate the young's modulus of the material of the given bar. • Demonstrate experiments using spectrometer to determine the dispersive power of prism and refractive index of the material of the prism • Determination of wavelength of Laser light using diffraction at a single slit 	Regional & National developmental needs

35	PHYSICS MAIN PRACTICALS – IV (ELECTRONIC EXPERIMENTS)	PP616	<ul style="list-style-type: none"> • To construct Halfsubtractor, Full subtractor, 4 bit binary adder and 4 bit binary subtractor circuits using ICs and verify their truth tables. • To simplify the given Boolean expressions using Karnaugh map, construct NAND-NAND circuit for the simplified expression and verify the truth table. • To design Inverting and Non inverting amplifiers, Summer, Subtractor, Differentiator and Integrator circuits using OPAMP. • To learn to construct amplifiers, Oscillators and Multivibrators using Transistors and measure their outputs. • To write assembly language programs for performing Addition, Subtraction, Multiplication, Division, Arranging the numbers in ascending order and in descending order and execute them using 8085 microprocessor and verify the results. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Construct Halfsubtractor, Full subtractor, 4 bit binary adder and 4 bit binary subtractor circuits using ICs and verify their truth tables. • Simplify given Boolean expressions using Karnaugh map, construct NAND-NAND circuit for the simplified expression and verify the truth table. • Design Inverting and Non inverting amplifiers, Summer, Subtractor, Differentiator and Integrator circuits using OPAMP. • Construct amplifiers, Oscillators and Multivibrators using Transistors and measure their outputs. • Write assembly language programs for performing Addition, Subtraction, Multiplication, Division, Arranging the numbers in ascending order and in descending order and execute them using 8085 microprocessor and verify the results. 	Regional & National developmental needs
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36	SUBJECT SKILL – I : ELECTRICAL CIRCUITS AND NETWORKS (THEORY)	P634S	<ul style="list-style-type: none"> • To develop an understanding of the basics of electrical devices and circuits. • To understand the fundamental laws of electrical circuits and various circuit analysis theorems. • To develop an understanding of single-phase and three-phase AC. • To know the effect of open circuits and short circuits • To impart knowledge of domestic wiring and circuit breakers. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Understand the symbols and working principles of electrical devices and circuits • Analyze electrical circuits (DC and AC) using mesh and network simplification theorems. • Differentiate between single-phase and three-phase AC and explain the working of AC circuits. • Explain the effects of shorts and opens in series and parallel circuits. • Understand domestic electrical wiring and the working of circuit breakers 	Regional & National developmental needs
37	BASIC INSTRUMENTATIO N	P641S	<ul style="list-style-type: none"> • To develop knowledge of principles and working of various analog meters. • To understand the principle and working of analog electrical instruments. • To impart knowledge of principles and working of digital instruments. • To learn about the working principle of various optical instruments used in measurement of physical quantities. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Acquire knowledge about the working principles of various analog meter instruments. • Understand the operation of various analog electrical instruments. • Differentiate between digital and analog instruments and explain their working. • Outline the working principle of various optical instruments. 	Regional & National developmental needs

			<ul style="list-style-type: none"> To develop the skill of usage of environmental instruments. 	<ul style="list-style-type: none"> Gain knowledge on the working and applications of various environmental instruments. 	
38	NON MAJOR ELECTIVE –I : REPAIR AND MAINTENANCE OF HOUSEHOLD APPLIANCES	NPH503	<ul style="list-style-type: none"> To provide an understanding of the basics of electricity and electrical safety. To enable the students to understand the importance of earthing and energy storage devices. To expose the students to the principles and working of home appliances. To learn fault finding and replacing faulty component in electric iron. To train the students in Repaire and Maintenance of home appliances. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Recall the safety precautions and apply them whenever it is necessary Understand the importance of earthing and acquire a knowledge on energy storage devices Identify the fault in an electric iron box and rectify it Explain the working of mixer, grinder, ceiling and table fans. Install and test fluorescent lamp chock and starter 	Regional & National developmental needs
39	PHYSICS REVISITED SSP	P643SP1	<ul style="list-style-type: none"> To enable the students to revise the concepts of mechanics, oscillations, waves, Black body radiation. To recollect the concepts of thermodynamics and statistical physics. To revisit the contents of Quantum mechanics 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> Recollect the basic concepts in mechanics, Waves and oscillations and explain black body radiation. Recall the laws of thermodynamics, classical and quantum statistics. 	Regional & National developmental needs

			<ul style="list-style-type: none"> • To help the students to review the concepts in Atomic and Nuclear Physics. • To understand the significance of semiconductor devices and their applications, this would help them to perform better in competitive examinations. 	<ul style="list-style-type: none"> • Formulate the Schrodinger wave equation for free state and bounded state problems and evaluate the energy eigen value • Summarize the concepts in Atomic and Nuclear Physics. • Outline the working principle of semiconductor devices . 	
40	NON MAJOR ELECTIVE: PHYSICS IN EVERYDAY LIFE	NPH603	<ul style="list-style-type: none"> • To provide insights about the role of electromagnetic rays in everyday life • To understand the origin of acoustic waves and their applications • To understand the role of heat and fluids in our day to day life • To explore the working principle of electrical devices • To provide a broad view on heavenly bodies. 	<p>On successful completion of the course, the students will be able to</p> <ul style="list-style-type: none"> • Explain the reason behind the appearance of colors • explain the origin and applications of sound waves • explain applications of heat in everyday life • Rectify the faults in electrical heating devices • describe the salient features of objects in the universe 	National developmental needs