



# MANNAR THIRUMALAI NAICKER COLLEGE

A Co-educational, Autonomous and Linguistic Minority Institution

Affiliated to Madurai Kamaraj University

Re-accredited with "A" Grade by NAAC

Pasumalai, Madurai – 625 004 Tamil Nadu.

## CURRICULUM RELEVANCE TO THE LOCAL, REGIONAL, NATIONAL AND GLOBAL NEEDS

NAME OF THE PROGRAMME: B.SC.PHYSICS

PROGRAMME CODE: UPH

### PROGRAMME OUTCOME

**PO1.** Demonstrate the knowledge and understanding of Science concepts and its relevant fields.

**PO2.** Identify, formulate, analyze complex problems and reach valid conclusions using the methodologies of Science.

**PO3.** Employ critical and analytical thinking in understanding the concepts and apply them in various problems appearing in different branches of Science.

**PO4.** Communicate the known concepts effectively within the profession and with any forum.

**PO5.** Function successfully as a member/leader in any team and to apply ethics, accountability and equity in their life.

**PO6.** Use ICT tools in various learning situations, related information sources, suitable software to analyze data and further more participating in learning activities throughout life to meet the demands of work place through knowledge /up-skilling / re-skilling.



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## PROGRAMME SPECIFIC OUTCOMES

**PSO1:** Demonstrate a fundamental understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Mechanics & Properties of Matter, Heat & Thermodynamics, Electricity, Magnetism, Optics & Photometry, Nuclear & Particle Physics, Condensed matter Physics, Atomic & Molecular Physics, Mathematical Physics, Classical & Statistical Mechanics, Quantum Mechanics & relativity, Electronics and its linkages with related disciplinary areas / subjects like Chemistry, Mathematics, Life sciences, Environmental sciences.

**PSO2:** Tackle problems and offer out of the box solutions based on analysis and critical think deeply rooted in concepts of Physics.

**PSO3:** Problem-solving skills that are required to solve different types of Physics-related problems with well-defined solutions, and tackle open-ended problems that belong to the disciplinary-area boundaries.

**PSO4:** Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics related Problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.

**PSO5:** Apply the knowledge acquired to analyse and design models in the versatile realm of physics.

**PSO6:** Plan and execute Physics-related experiments or investigations, analyze and interpret data/information collected using appropriate methods. And the findings of the experiment while relating the Conclusions to relevant theories of Physics.



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Sl. No	Course Code	Course Name	Course Outcomes
1.	21UPHC51	Atomic Physics and Quantum Mechanics	<b>CO1:</b> Describe the various theories of atomic model <b>CO2:</b> Explain Pauli's exclusion principle, Electronic Configurations and Zeeman Effect <b>CO3:</b> Gain knowledge about X-ray spectra and Compton effects <b>CO4:</b> Understand the basic concepts of Matter waves and dual nature of matter and radiation <b>CO5:</b> Utilize and solve Schrodinger equations to obtain wave function for some basic, physically important types of potential
2.	21UPHC52	Analog Electronics	<b>CO1:</b> Recollect Semiconductors , diodes ,transistors , amplifiers transmitters , receivers <b>CO2:</b> Understand feedback principle <b>CO3:</b> Gain knowledge about different types of Oscillators <b>CO4:</b> Recall types of transistor connection and biasing <b>CO5:</b> Understand types of modulation.
3.	21UPHCP3	Non - Electronics Practical	<b>CO1:</b> Understand the function of instruments like spectrometer and spot galvanometer <b>CO2:</b> Relate analyse angle of incidence and emergence <b>CO3:</b> Find wavelength of light and particle size using laser <b>CO4:</b> Compare the impedance and power factor of LR and CR circuits <b>CO5:</b> Justify, Bridge circuits, Grating, LCR circuits



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4.	21UPHCP4	Electronics Practical	<p><b>CO1:</b> Understand the principles and applications of Digital Electronics</p> <p><b>CO2:</b> Understand the principles and applications of Analog Electronics</p> <p><b>CO3:</b> Gain knowledge about the development of the Microprocessors.</p> <p><b>CO4:</b> Motivate the students to apply the principles of Digital Electronics in their day-to-day life.</p> <p><b>CO5:</b> Motivate the students to apply the principles of Analog Electronics in their day-to-day life.</p>
5.	21UPHE51	Concepts of Nuclear Physics	<p><b>CO1:</b> Understand the structure of the nucleus and nuclear forces.</p> <p><b>CO2:</b> Understand working of particle accelerators and detectors.</p> <p><b>CO3:</b> Remember the laws and properties of radioactivity, Alpha and Beta decay</p> <p><b>CO4:</b> Understand the nuclear transmutations, photo disintegration, nuclear fission and fusion.</p> <p><b>CO5:</b> Apply the nuclear energy to the production of electricity using different reactors.</p>
6.	21UPHE53	Basics of Astrophysics	<p><b>CO1:</b> Understand the Understanding the Sky and Constellation.</p> <p><b>CO2:</b> Understand the Special Theory of Relativity and Telescopes.</p> <p><b>CO3:</b> Remember the Planets, Kepler's Laws, Comets and Asteroids.</p> <p><b>CO4:</b> Understand the sun structure and nuclear fusion.</p> <p><b>CO5:</b> Apply the concepts of astrophysics to the Astronomy and cosmology</p>



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7.	21UPHE52	Condensed Matter Physics	<p><b>CO1:</b> Understand the arrangements of atoms in the crystalline materials and specific heat theories of solids.</p> <p><b>CO2:</b> Understand the electrical and thermal conductivities of metal, properties and applications superconductors. <b>CO3:</b> Remember the different types of magnetism, properties and applications of magnetic materials.</p> <p><b>CO4:</b> Understand the different types of polarization, dielectric loss, dielectric strength and breakdown</p> <p><b>CO5:</b> Understand the general properties of semiconductors, carrier concentration for intrinsic and extrinsic semiconductors.</p>
8.	21UPHS51	Gemology	<p><b>CO1:</b> Recall the basic concepts, types , physical properties and Identification of Gems.</p> <p><b>CO2:</b> Determine the formation of Gems.</p> <p><b>CO3:</b> Remember the classification of Gems and minerals.</p> <p><b>CO4:</b> Analyzing the different cuts in Gems</p> <p><b>CO5:</b> Applications of gems in Laser and various medical treatments</p>
9.	21UPHE54	FUNDAMENTALS OF MOLECULAR SPECTROSCOPY	<p><b>CO1:</b> state the general features of spectroscopy</p> <p><b>CO2:</b> demonstrate the principle and applications of vibrational spectroscopy</p> <p><b>CO3:</b> make use of the theory of electronic spectroscopy in analyzing compounds</p> <p><b>CO4:</b> analyse the structure of organic compounds using NMR spectroscopic techniques</p> <p><b>CO5:</b> Explain the applications</p>



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			of mass spectrometry in identifying various types of molecules
10.	21UPHE55	SENSORS AND ORGANIC ELECTRONICS	<b>CO1:</b> define the terms and characteristics of sensors. <b>CO2:</b> compare and contrast various types of sensors. <b>CO3:</b> outline the principles of temperature sensors. <b>CO4:</b> interpret and relate the structure and properties of OLEDs. <b>CO5:</b> construct various organic electronic materials.
11.	21UPHE56	PARTICLE PHYSICS	<b>CO1:</b> list the fundamental particles <b>CO2:</b> explain the discrete symmetries <b>CO3:</b> illustrate the Gauge Symmetries and Quantum chromodynamics <b>CO4:</b> categorize the Symmetry Breaking <b>CO5:</b> Identify the Standard Model of electroweak interactions
12.	21UPHC61	Principles of Classical and Statistical Mechanics	<b>CO1:</b> Study the fundamental concepts in Classical Mechanics and apply the conservation laws and constraints for a system of particles <b>CO2:</b> Understand the Lagrangian Formulation for a mechanical system <b>CO3:</b> Apply the Hamiltonian Formulation for a mechanical system <b>CO4:</b> Remember the importance of statistical Mechanics <b>CO5:</b> Understand the postulates of wave mechanics, Maxwell–Boltzmann Statistics and Quantum Statistics
13.	21UPHPR1	Project and Viva - Voce	-



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14.	21UPHE61	Digital Principles and Applications	<p><b>CO1:</b> Review the fundamental concepts in number systems and codes.</p> <p><b>CO2:</b> Recall the properties of Boolean algebra.</p> <p><b>CO3:</b> Analyze and apply the basic concepts of Logic Gates and Arithmetic Circuits. <b>CO4:</b> Understand the operation of Flip flops and apply it to Counters and Registers.</p> <p><b>CO5:</b> Gain the knowledge about Combinational Circuits like Multiplexers, Decoders and Encoders.</p>
15.	21UPHE62	Basics in Microprocessors	<p><b>CO1:</b> Understand the Understanding the Sky and Constellation.</p> <p><b>CO2:</b> Understand the Special Theory of Relativity and Telescopes.</p> <p><b>CO3:</b> Remember the Planets, Kepler's Laws, Comets and Asteroids.</p> <p><b>CO4:</b> Understand the sun structure and nuclear fusion.</p> <p><b>CO5:</b> Apply the concepts of astrophysics to the Astronomy and cosmology.</p>
16.	21UPHE63	Mathematical Physics	<p><b>CO1:</b> Recall and solve various types of vectors</p> <p><b>CO2:</b> Review the operations of matrices</p> <p><b>CO3:</b> Solve various types of differential equations</p> <p><b>CO4:</b> Explore various Fourier series and also to determine its transforms</p> <p><b>CO5:</b> Evaluate the functions of complex variables</p>
17.	21UPHS61	Optoelectronics	<p><b>CO1:</b> Understand the propagation of light waves in an optical fibre.</p> <p><b>CO2:</b> Understand losses and dispersion in optical fibres.</p> <p><b>CO3:</b> Remember the concepts of</p>



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			LED and semiconductor laser diode. <b>CO4:</b> Understand the types of optical couplers. <b>CO5:</b> Apply the concepts of fibre optics in communication system.
18.	21UPHE64	NANOTECHNOLOGY	<b>CO1:</b> State the basics of nanoscience and Nanotechnology <b>CO2:</b> Demonstrate the methods of synthesis of nanomaterials <b>CO3:</b> Explain the principles of various characterization techniques <b>CO4:</b> Analyse the properties of nanomaterials practically <b>CO5:</b> Make use of the properties of nanomaterials and their possible applications
19.	21UPHE65	NON-RENEWABLE ENERGY PHYSICS	<b>CO1:</b> Relate various sources of non-conventional energy <b>CO2:</b> Outline the solar energy harvesting and storage <b>CO3:</b> Explain the principle behind wind energy and biomass energy <b>CO4:</b> Develop the concept of geothermal and ocean energy <b>CO5:</b> Analyze newer technologies in energy conversion
20.	21UPHE66	COMMUNICATION ELECTRONICS	<b>CO1:</b> Relate the communication process. <b>CO2:</b> Outline the principles of analog modulation <b>CO3:</b> Explain the working of analog and digital pulse modulation <b>CO4:</b> Distinguish various concepts of communication systems. <b>CO5:</b> Develop various types of communications.
21.	21UPHC31	Electricity	<b>CO1:</b> Explain Coulomb's Law, Flux of an Electric Field, Capacitors and Capacitance, Electric Current and current Density, Alternating Current.



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			<p><b>CO2:</b> Solve the Electric Potential due to a Point Charge, Gauss's Law from Coulomb's Law, Combination of Capacitors, Combination of Resistors in Series and Parallel, Simple AC Circuits</p> <p><b>CO3:</b> Calculate Potential Energy of a Dipole, Flux of an Electric Field, Energy Stored in a Capacitors and Energy Density in Electric Field, Current in an AC Circuit, Power in AC Circuits</p> <p><b>CO4:</b> Discuss about the Electric Field inside a Conductor, Application of Gauss's Law, Stretched-wire potentiometer, Grouping of Batteries</p> <p><b>CO5:</b> Illustrate the Potential Energy of a Dipole, Spherical Charge Distribution, Parallel-plate Capacitor with a Dielectric, Wheatstone Bridge, Hot-wire Instruments</p>
22.	21UPHC32	Magnetism	<p><b>CO1:</b> Explain Magnetic Field B, Bio-Savart Law, Permanent Magnets, Magnetic properties, Faraday's laws of Electromagnetic Induction - Lenz's Law.</p> <p><b>CO2:</b> Solve the Motion of a Charged Particle in a Uniform Magnetic Field, Magnetic Field due to a Current in a straight wire, Magnetic field due to a Bar Magnet, Intensity of Magnetization, Growth and Decay of current in an LR</p> <p><b>CO3:</b> Calculate Torque on a current loop, Filed due to a Circular Current, Tangent Law of Perpendicular Fields, Eddy current</p> <p><b>CO4:</b> Discuss about Torque on a current loop, Solenoid, Deflection</p>



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			<p>Magnetometer, Properties of Dia, Para and Ferromagnetic Substances, Mutual Induction</p> <p><b>CO5:</b> Illustrate Motion of a Charged Particle in a Uniform Magnetic Field, Magnetic Field at a point due to a Long, Straight Current Oscillation</p> <p>Magnetometer, Permeability, Energy stored in an Inductor</p>
23.	21UCHA31	Allied Chemistry – I	<p><b>CO1:</b> Outline the concepts behind the properties of all the elements.</p> <p><b>CO2:</b> Describe the structure of many types of molecules.</p> <p><b>CO3:</b> Interpret numerous types of interactions in compounds.</p> <p><b>CO4:</b> Compare and contrast different types of reactions.</p> <p><b>CO5:</b> Demonstrate various types of properties of molecules.</p>
24.	21UPHN31	Physics Appliances in Everyday life	<p><b>CO1:</b> Recalling types of electricity, fuse, toaster and Fan</p> <p><b>CO2:</b> Explain the function of fuse, electric cooker, remote controller and inverter</p> <p><b>CO3:</b> Uses of Direct current, Alternating current, wet grinder, vacuum cleaner, LED and Smart TV</p> <p><b>CO4:</b> Distinguish ac and dc current, microwave oven and toaster, mixer and grinder, Table fan and ceiling fan</p> <p><b>CO5:</b> Utilization and influence of refrigerator, water purifier, solar panel, LED, Air conditioner</p>
25.	21UPHC41	Optics and Photometry	<p><b>CO1:</b> Understand the basic concepts in light waves, Interference, Diffraction, Polarisation, Dispersion and Spectra, Photometry, Speed of light and Optical Instruments.</p> <p><b>CO2:</b> Apply the optical Path,</p>



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			<p>interference from thin films, Fraunhofer Diffraction by a single slit, Fraunhofer Diffraction by a circular aperture, Fresnel Diffraction at a straight edge Dispersion without average deviation and average deviation without dispersion, luminosity of radiant flux-Luminous flux, Relative luminosity, Luminous Efficiency, Luminous Intensity.</p> <p><b>C03:</b> Illustrate Intensity variation, fringe-width, the angle of a prism, the angle of minimum deviation for a prism for a given wavelength, variation of refractive index with wavelength, Inverse square law, Lambert's Cosine law, Scattering of Light and Polarization of light.</p> <p><b>C04:</b> Discuss about Huygen's Principle ,Young's Double Hole experiment ,Young's Double slit experiment, Fresnel Biprism, Scattering of light, Polarisation of light, Spectrum, kinds of spectra, Ultraviolet and Infrared spectrum, Rainbow, Photometers, Michelson method , Spectrometer, Resolving power of a microscope and a telescope.</p> <p><b>C05:</b> Compare Fraunhofer and Fresnel diffraction, Coherent and incoherent sources, Simple microscope and Compound microscope, Astronomical telescope, Terrestrial telescope and Galilean Telescope</p>
26.	21UCHA41	Allied Chemistry – II	<p><b>CO1:</b> Describe the feasibility and rate of reactions occurring in solids, solutions and gases.</p> <p><b>CO2:</b> Explain the electrochemical, catalytic and thermodynamic transformations</p>



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			<p>and can illustrate their scope to wider areas.</p> <p><b>CO3:</b> Interpret various chemical processes taking place in all the three phases.</p> <p><b>CO4:</b> Analyze the significances of various compounds in daily life.</p> <p><b>CO5:</b> Implement the applications of physical chemistry.</p>
27.	21UPHC42	Medical Instrumentation	<p><b>CO1:</b> Recalling and Understanding concepts of the basics of electrodes, Colorimeter, Shortwave, Microwave and Ultrasonic waves Differentiate the Electrode types, Internal and External</p> <p><b>CO2:</b> Defibrillators , Single channel and Multichannel telemetry system, Thermograph , Endoscopes ,Lasers in Medicine and Computer Tomography</p> <p><b>CO3:</b> Build the knowledge in the field of Electro Cardiography , Electromyography , Respiratory Rate Measurement , Dializers , Nuclear imaging Techniques and Physiological monitoring system in space station</p> <p><b>CO4:</b> Utilization of Micropipet , Blood cell counter, Pacemakers, Electro Surgical Diathermy and Telemedicine</p> <p><b>CO5:</b> Influence of Electro Oculography , oxygenators, Cryogenics Applications , Design of Bio Telemetry and Pulse measurement</p>
28.	21UPHN41	Non Conventional Energy Resources	<p><b>CO1:</b> Define energy, Earth radiation, Solar radiation, Solar cell, Wind power, Biomass</p>



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			<p>Classify energy resources, Extraterrestrial and terrestrial</p> <p><b>CO2:</b> radiations, Solar cell- Solar photovoltaic, Biomass resources, Origin of winds</p> <p><b>CO3:</b> Apply conventional and non-conventional energy sources, Spectral energy distribution, Solar industrial heating systems, Biomass conversion technologies, Wind power</p> <p><b>CO4:</b> Distinguish conventional and non-conventional energy sources, Earth radiation and solar radiation, Solar air heater and solar water heater, tidal energy and biomass energy, global winds and local winds.</p> <p><b>CO5:</b> Justify environmental aspects of energy ,Sun as a source of Energy, Solar photovoltaic systems, Usable forms of biomass, Factors affecting the distribution of wind energy on the surface of the earth</p>
29.	21UPHCP2	Major Physics Practical – II	<p><b>CO1:</b> Apply the concepts of Field along the axis of the coil</p> <p><b>CO2:</b> Acquire the knowledge of Physical optics using Spectrometer</p> <p><b>CO3:</b> Gain Knowledge in principles and applications of Potentiometer, wheatstone's Bridge applications and Spot reflection Galvanometer</p> <p><b>CO4:</b> Understand the principles of Specific rotatory power in liquids</p> <p><b>CO5:</b> Apply skill in the field of Interference and Diffraction of Light</p>
30.	21UCHAP1	Allied Chemistry Practicals	<p><b>CO1:</b> Develop skill in titrimetric analysis.</p> <p><b>CO2:</b> Interpret the redox</p>



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			<p>reactions.</p> <p><b>CO3:</b> identify the functional groups present</p> <p><b>CO4:</b> distinguish properties of functional groups of same element</p> <p><b>CO5:</b> defend their results using confirmatory test</p>
31.	21UPHC11	Mechanics, Properties of Matter and Sound	<p><b>CO1:</b> To review the fundamental concepts in Centre of Mass, Linear Momentum, Collision</p> <p><b>CO2:</b> To recall the Properties of Rotational Mechanics</p> <p><b>CO3:</b> To analyze the basic concepts of Properties of Matter like elasticity, surface tension and viscosity.</p> <p><b>CO4:</b> To understand the concepts of Measurement of Gravitational Constant, acceleration due to gravity, Kepler's laws, escape velocity, black hole</p> <p><b>CO5:</b> To understand the Nature and Propagation of Sound Waves and acoustics</p>
32.	21UPHCP1	Major Physics Practical – I	<p><b>CO1:</b> To create the practical knowledge in basic physics experiments.</p> <p><b>CO2:</b> To understand the bending of beam, compound pendulum and torsion pendulum.</p> <p><b>CO3:</b> To understand current conduction in electrical circuits.</p> <p><b>CO4:</b> To motivate the students to apply the experimental techniques in Optics and Sound.</p> <p><b>CO5:</b> To create skill in doing the experiment individually</p>
33.	21UPHS11	Laser and its Applications	<p><b>CO1:</b> To understand the principle and characteristics of laser.</p> <p><b>CO2:</b> To remember the Laser action and Optical resonators.</p>



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			<p><b>CO3:</b> To understand the classification of lasers.</p> <p><b>CO4:</b> To understand and apply the lasers in medical field and process of lasers in materials.</p> <p><b>CO5:</b> To understand and apply the lasers in communication and commercial fields.</p>
34.	21UPHS12	Basics of Microsoft office	<p><b>CO1:</b> To remember desktop, recycle bin, creating shortcuts and control panel windows vista.</p> <p><b>CO2:</b> To understand the opening screen of Microsoft word screen, home panel, page setup and mailing panel in Microsoft office word 2007.</p> <p><b>CO3:</b> To understand formatting and alignment of text, spell checking, saves as options and printing the document in Microsoft office word 2007.</p> <p><b>CO4:</b> To understand worksheet in excel 2007, worksheet fitting on a pages, formatting numbers and labels and adding-deleting rows and columns in Microsoft office word 2007.</p> <p><b>CO5:</b> To remember the different molecular mechanisms.</p>
35.	21UPHC21	Heat and Thermodynamics	<p><b>CO1:</b> To remember the fundamental concepts in Law of Thermodynamics.</p> <p><b>CO2:</b> To recall the Properties of Kinetic Theory of Gases.</p> <p><b>CO3:</b> To analyze and apply the basic concepts Specific Heat Capacity.</p> <p><b>CO4:</b> To understand and apply Isothermal and Adiabatic Processes</p> <p><b>CO5:</b> To reveal the properties of Thermal Radiation</p>



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36.	21UPHS21	Bio physics	<b>CO1:</b> To understand the electromagnetic radiation spectrum and arrangements of electron in orbitals in an atom. <b>CO2:</b> To remember the radio activities and their applications. <b>CO3:</b> To apply the concepts of biophysics in instruments. <b>CO4:</b> To understand the structure of molecular components of cell, lipids and nuclides. <b>CO5:</b> To remember the different molecular mechanisms.
37.	21UPHS22	Basics of C Programming	<b>CO1:</b> To remember Programming fundamentals, Program