Sree Narayana Mangalam College, Maliankara

(Affiliated to Mahatma Gandhi University, Kottayam)

PROGRAMME OUTCOME

PROGRAMME SPECIFIC OUTCOME, COURSE OUTCOME

B.Sc. PHYSICS

Sree Narayana Mangalam College
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At the end of the Under Graduate Program at S.N.M College, Maliankara, a student will have developed:

UNDER GRADUATE PROGRAMME OUTCOMES

PO1:	**Problem solving and critical thinking:** Critical thinking skills help the students understand and assess a situation based on all the facts and information available. With the help of critical thinking skills, students can sort and organise information, data and facts to define and solve a problem. This program outcome can ensure that the students receive ample opportunities to work on these skills by providing them with pragmatic modes of learning in their respective subjects.
PO2:	**Global Perspective and social interaction:** This program outcome ensure that the students attain an ability to respect the viewpoints of those from diverse cultures, races, ages, genders, religions and lifestyles to build collaborative relationships and communicate effectively. The ability to appreciate, value, and learn from other cultures and perspectives. It also suggests in recognising instance of unhealthy influences around them and the relying on inspirations of growth and stability.
PO3:	**Ethics:** This program outcome helps in adhering to basic ethical values combined with strong subject awareness that promises in creating a complete package of genuine result guaranteeing individuals. To be ethical means that you respect, care and love hard work and consider it a valuable quality. Ethics in work place means dependable, productive, collaborative, and passionate.
PO4:	**Environment and Sustainability:** This program outcome makes students aware of, sensitive to, and knowledgeable about the environment and its interconnectedness to social and economic systems, while encouraging them to develop attitudes of concern and motivation, as well as practical, complex systems and critical thinking skills to identify and solve environmental problems. An individual can be called educated when he/she recognises and shows respects to other forms of living things.
PO5:	**Effective Citizenship:** This program outcome develops the student's capacity to feel socially responsible to her community and to take

	corresponding action to support its assets and to deal with its concerns. It also develops ability to demonstrate empathetic social concern and equity-based national development.
PO6:	**Effective Communication:** This program outcome creates ability to communicate effectively and possess scientific temper and modern outlook of the world. Ability to speak, reading, writing and listening carefully are the three most important communication skills to be developed by every individual for their life journey.
PO7:	**Life-long learning:** Engage in life-long learning to acclimatize themselves in an ever-changing world. We need to continually keep our skills sharp and up to date so that we have an edge in all we do.

PROGRAMME SPECIFIC OUTCOMES

At the end of B.Sc Physics at S.N.M College, Maliankara, a student will have developed:

PSO1	Ability to read, understand and interpret physical information – verbal, mathematical and graphical.
PSO2	Skills required for gathering information from resources and using them.
PSO3:	Ability to perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
PSO4:	Enhance the ability to apply information communication technology to gather knowledge at will.
PSO5:	Understanding of core Physics by covering a range of topics in almost all areas of physics including Classical and Quantum Mechanics, Electricity and Electrodynamics, Relativity and spectroscopy, Thermal and Statistical Physics, Nuclear and Particle physics, Solid State Physics, Digital Electronics etc. along with one choice based courses, Open course and had experience of independent work such as projects, seminars etc. and thereby developing their experimental skills through a series of experiments which also illustrate major themes of the lecture courses.
PSO6:	Skill for employment and further studies in physics.

COURSE OUTCOMES: CORE COURSE (THEORY)

SEMESTER I

PH1CRT01- Methodology and Perspectives of Physics

At the end of this course, a student will have developed ability to:

CO1:	Examine the life history of great scientists and their contributions to the world of Physics.
CO2:	Apply various number systems in microprocessors and computers.
CO3:	Apply vectors and coordinate systems in solving problems.
CO4:	Analyse experimental errors and their calculation in various computing methods.

SEMESTER II

PH2CRT02- Mechanics and Properties of Matter

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge about the dynamics of rigid body, study of oscillations and waves.
CO2:	Analyse the mechanical properties of matter such as elasticity, fluid dynamics, surface tension etc that helps to explain any physical processes and their advances.
CO3:	Explain one dimensional motion and dependence of force on position, velocity and time
CO4:	Explain the two-dimensional motion like that of projectile motion.

SEMESTER III

PH3CRT03- Optics, Laser and Fiber Optics

At the end of this course, a student will have developed ability to:

CO1:	Understand basic physics behind the phenomenon of interference, diffraction and polarization of light.
CO2:	Understand the working principle of laser and medical applications of laser.
CO3:	Acquire knowledge about propagation of light through optic fibers, fundamentals of holography.
CO4:	Solve problems related to optics.

SEMESTER IV

PH4CRT04- Semiconductor Physics

At the end of this course, a student will have developed ability to:

CO1:	Understand the concepts of doping, current -voltage characteristics of PN junction diode, design and analysis of rectifier circuits, voltage regulator circuits, voltage multiplier circuits and wave shaping circuits.
CO2:	Design and analyse various transistor amplifier circuits and oscillator circuits.
CO3:	Understand fundamentals of energy band theory in semiconducting materials.
CO4:	Apply the knowledge of basic semiconductor material physics and understand fabrication processes.

SEMESTER V

PH5CRT05- Electricity and Electrodynamics

At the end of this course, a student will have developed ability to:

CO1:	Understand the principles, dynamic and static phenomenon of electromagnetism.
CO2:	Define the fundamental concepts of LR, CR and LCR circuits, power in an ac circuit, choke coil and transformer.
CO3:	Explain network theorems related to ideal voltage source and ideal current source.
CO4:	Explain Maxwell's equations of electromagnetic waves.

PH5CRT06 - Classical and Quantum Mechanics

At the end of this course, a student will have developed ability to:

CO1:	Understand Newtonian mechanics, Lagrangian dynamics, Hamiltonian mechanics, Lorentz transformations and special theory of relativity.
CO2:	Acquire knowledge about the limitations of classical physics and the emergence of quantum mechanics that can solve Schrodinger equation for various configurations.
CO3:	Apply general formalism of classical and quantum mechanics to various problems.
CO4:	Understand and explain the differences between classical mechanics and quantum mechanics.

PH5CRT07- Digital Electronics and Programming

At the end of this course, a student will have developed ability to:

CO1:	Explain the basic logic operations of NOT, AND, OR, NAND, NOR, XOR and XNOR gates.
CO2:	Explain the logic behind the operation of registers, counters and flip flops.
CO3:	Simplify circuits and Boolean expressions using Boolean laws.
CO4:	Understand the concept of object oriented programming and its design through C++ programming to solve simple problems.

PH5CRT08 - Environmental Physics and Human Rights

At the end of this course, a student will have developed ability to:

CO1:	Identify various types of natural resources, human impact on these resources and common resource management practices.
CO2:	Be aware of keeping the environment healthy and sustainable for the future.
CO3:	Create awareness on various environmental acts in India.
CO4:	Identify issues and problems related to human rights.

PH5OPT02 - Physics in Daily Life (Open Course)

At the end of this course, a student will have developed ability to:

CO1:	Understand units and dimensions of fundamental and derived quantities.
CO2:	Identify the various phenomenon of light.
CO3:	Understand basic concepts of motion, electricity and electric power generation systems.
CO4:	Understand basic concepts of motion, electricity and electric power generation systems.

SEMESTER VI

PH6CRT09 - Thermal and Statistical Physics

At the end of this course, a student will have developed ability to:

CO1:	Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, free energies, partition functions.
CO2:	Understand basic concepts and working of heat engines.
CO3:	Use the statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.
CO4:	Explain fundamental concepts of statistical mechanics and computation of thermodynamics of ideal monoatomic gas.
C05:	Derive Maxwell's thermodynamic relations.

PH6CRT10 – Relativity and Spectroscopy

At the end of this course, a student will have developed ability to:

CO1:	Understand the postulates of special theory of relativity.
CO2:	Understand introductory concepts of general theory of relativity.
CO3:	Describe various atom models such as Bohr atom model and vector atom model.
CO4:	Acquire knowledge on rotational, vibrational and electronic spectra of molecules, Basic principles of Raman effect, Zeeman effect, Paschen Back effect, NMR and ESR spectroscopy.

PH6CRT11 - Nuclear, Particle Physics and Astrophysics

At the end of this course, a student will have developed ability to:

CO1:	Identify the various properties of nucleus and the nuclear forces.
CO2:	Understand the basic concepts of radioactivity, nuclear fission and nuclear fusion.
CO3:	Explain the properties of elementary particles and their interactions.
CO4:	Understand the universe which includes supernova explosion and the subsequent production of elements, stellar evolution, basic ideas on white dwarf, neutron star and black hole.

PH6CRT12 – Solid State Physics

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge on various crystal structures such as SC, BCC, FCC, HCP, concepts on crystal lattice, unit cell and lattice parameters.
CO2:	Explain the basic concepts of free electron theory and band theory of solids.
CO3:	Understand the basic concept of semiconductor, hall effect, principles of LED and photodiode, superconductivity, polarization and magnetism.
CO4:	Understand the basic concepts of force between atoms and bonding between molecules.

PH6CBT03 – Computational Physics (Choice Based course)

At the end of this course, a student will have developed ability to:

CO1:	Discuss the methods to solve linear and non linear algebraic equations by numerical methods.
CO2:	Explain the methods for curve fitting and interpolation.
CO3:	Solve the problems of curve fitting, interpolation, numerical integration and differentiation.
CO4:	Explain the methods for curve fitting and interpolation.

COURSE OUTCOMES: CORE COURSE (PRACTICAL)

SEMESTER I & II

PH2CRP01 - Mechanics and Properties of Matter

At the end of this course, a student will have developed ability to:

CO1:	Develop experimental skills through a series of experiments based on topics covered under the lecture course - Mechanics and Properties of Matter.
CO2:	Perform various experiments such as determination of acceleration due to gravity at a place, measurement of Young's Modulus of various materials, study of viscosity and surface tension of different types of liquids.
CO3:	Interpret the results of observations including making an assessment of experimental uncertainties.
CO4:	Develop experimental skills through a series of experiments based on topics covered under the lecture course - Mechanics and Properties of Matter.

SEMESTER III & IV

PH4CRP02 - Optics and Semiconductor Physics

At the end of this course, a student will have developed ability to:

CO1:	Perform experiments related to optics (measurement of refractive index using spectrometer, measurement of wavelength using Newton's rings apparatus etc).
CO2:	Perform experiments related to electronics (study of transistor characteristics, operational amplifier, clipper and clamper, determination of ripple factor of rectifiers).
CO3:	Study oscillatory circuits and voltage regulators.
CO4:	Acquire in depth knowledge about the theories that they have learned related to the topics on optics and electronics and become capable of suggesting alternate experimental methods for verifying the theories.

SEMESTER V & VI

PH6CRP03 - Electricity, Magnetism and Laser

At the end of this course, a student will have developed ability to:

CO1:	Effectively engage in advanced experiments using potentiometer, Searle's vibration magnetometer, deflection and vibration magnetometer, Carey Foster's bridge etc.
CO2:	Perform experiments related to laser.
CO3:	Perform experiments related to optic fibers.
CO4:	Critically evaluate and analyze the results of the experimental measurements.

PH6CRP04 – Digital Electronics

At the end of this course, a student will have developed ability to:

CO1:	Realize logic gates NOT, AND, OR, NOR, NAND, XOR, XNOR and verification of their truth tables.
CO2:	Design of astable, monostable and bistable multivibrator using transistor and IC 555.
CO3:	Construct SR and JK flip flops using IC 7400 and IC 7410.
CO4:	Design of multiplexer and demultiplexer using gates, shift registers and digital counter using IC 7490.

PH6CRP05 - Thermal Physics, Spectroscopy and C++ Programming

At the end of this course, a student will have developed ability to:

CO1:	Determine resolving power and dispersive power of grating using spectrometer.
CO2:	Study temperature coefficient of resistance and thermal conductivity.
CO3:	Determine resolving power and dispersive power of prism using spectrometer.
CO4:	Use computer programming using C++ to solve simple problems.

PH6CRP06 - Acoustics, Photonics and Advanced Semiconductor Physics

At the end of this course, a student will have developed ability to:

CO1:	Construct and evaluate line and load regulation of regulated power supply using zener diode and transistor.
CO2:	Familiarise wave shaping circuits, Op-Amps, AM and PWM circuits.
CO3:	Determine voltage current characteristics of solar cell, LED and LDR.
CO4:	Determine frequency using Melde's string and sonometer.

PH6PRO01 - Project and Industrial Visit

At the end of this course, a student will have developed ability to:

CO1:	Bring out their talents in experimental, theoretical or computational research.
CO2:	Oral and verbal presentation skills.
CO3:	Improve communication skills by interacting with experts in project field/industrial area by sharing and clarifying their doubts, seeking their opinion and advices etc.
CO4:	Analyse collected data and reach at a conclusion.
CO5:	Expand and develop their future research field.

COURSE OUTCOMES: COMPLEMENTARY COURSES

COMPLEMENTARY PHYSICS FOR MATHEMATICS (THEORY)

SEMESTER I

PH1CMT01 - Properties of Matter and Error Analysis

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge on mechanical properties of matter such as elasticity, fluid dynamics and surface tension.
CO2:	To explain natural physical processes and related technological advances.
CO3:	Analyse experimental errors and their calculation in various computing methods.
CO4:	Understand the fundamental concepts of hydrodynamics.

SEMESTER II

PH2CMT01 – Mechanics and Astrophysics

At the end of this course, a student will have developed ability to:

CO1:	Understand the basic concepts of motion under gravity, measurement of acceleration due to gravity at a place etc.
CO2:	Study rotational dynamics which includes measurement of moment of inertia of disc, circular ring, cylinder, sphere and flywheel.
CO3:	Acquire knowledge on oscillations and waves.
CO4:	Understand about universe, stellar atmosphere, stellar evolution, white dwarf, neutron star, black hole and supernova explosion.

SEMESTER III

PH3CMT01 – Modern Physics and Electronics

At the end of this course, a student will have developed ability to:

CO1:	Describe various atom models such as Bohr atom model and vector atom model.
CO2:	Acquire knowledge on nuclear structure, nuclear spin, nuclear mass, nuclear forces, nuclear binding energy, radioactivity and its applications.
CO3:	Formulate ideas of atomic, vibrational, molecular and electronic spectroscopy, Raman effect, fluorescence, phosphorescence, NMR spectroscopy etc.
CO4:	Understand current voltage characteristics of diode, efficiency and ripple factor of half wave and full wave rectifiers, construction and operation of transistor.
CO5:	Work on various number systems, Boolean algebra and simplification of Boolean equations.
CO6:	Design basic logic gates such as NOT, AND, OR, NAND, NOR, XOR, XNOR and verification of their truth tables.

SEMESTER IV

PH4CMT01 – Optics and Electricity

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge on basic phenomenon of light such as interference, diffraction and polarization.
CO2:	Understand the basic concepts of laser, fiber optics and dielectrics.
CO3:	Discuss on varying currents, growth and decay of current in LR, CR, LC and LCR circuits, concept of resonance.
CO4:	Understand fundamental concepts of varying current.

COMPLEMENTARY PHYSICS FOR MATHEMATICS (PRACTICAL)

SEMESTER I & II

PH2CMP01 – Complementary Physics Practical 1

At the end of this course, a student will have developed ability to:

CO1:	Understand the use of vernier callipers and screw gauge.
CO2:	Measure refractive index using spectrometer and liquid lens arrangement.
CO3:	Analyse surface tension and viscosity of liquids.
CO4:	Measure Young's modulus and rigidity modulus of materials.
CO5:	Determine the wavelength of laser using grating.

SEMESTER III & IV

PH4CMP02 – Optics and Electricity

At the end of this course, a student will have developed ability to:

CO1:	Measure acceleration due to gravity at a place.
CO2:	Measure dispersive power of prism and grating using spectrometer.
CO3:	Characterise zener diode, measurement of magnetic moment.
CO4:	Verify truth tables of logic gates.

COMPLEMENTARY PHYSICS FOR CHEMISTRY (THEORY)

SEMESTER I

PH1CMT02- Properties of Matter and Thermodynamics

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge on mechanical properties of matter such as elasticity, fluid dynamics and surface tension.
CO2:	To explain natural physical processes and related technological advances.
CO3:	Understand basic laws of thermodynamics.
CO4:	Understand the principle and working of Carnot engine, derivation of Maxwell's thermodynamic relations.

SEMESTER II

PH2CMT02 – Mechanics and Superconductivity

At the end of this course, a student will have developed ability to:

CO1:	Understand the basic concepts of motion under gravity, measurement of acceleration due to gravity at a place etc.
CO2:	Study rotational dynamics which includes measurement of moment of inertia of disc, circular ring, cylinder, sphere and flywheel.
CO3:	Acquire knowledge on oscillations and waves.
CO4:	Understand fundamental concepts of superconductivity, cooper pairs, Meissner effect, Type I and Type II superconductors.

SEMESTER III

PH3CMT02 – Modern Physics and Magnetism

At the end of this course, a student will have developed ability to:

CO1:	Describe various atom models such as Bohr atom model and vector atom model.
CO2:	Acquire knowledge on nuclear structure, nuclear spin, nuclear mass, nuclear forces, nuclear binding energy, radioactivity and its applications.
CO3:	Formulate ideas of atomic, vibrational, molecular and electronic spectroscopy, Raman effect, fluorescence, phosphorescence, NMR spectroscopy etc.
CO4:	Understand current voltage characteristics of diode, efficiency and ripple factor of half wave and full wave rectifiers, construction and operation of transistor.
CO5:	Understand the fundamental concepts of diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism.
CO6:	Understand hysteresis curve.

SEMESTER IV

PH4CMT02 – Optics and Solid State Physics

At the end of this course, a student will have developed ability to:

CO1:	Acquire knowledge on basic phenomenon of light such as interference, diffraction and polarization.
CO2:	Understand the basic concepts of laser, fiber optics and dielectrics.
CO3:	Understand various types of crystal structures such as SC, BCC, FCC, HCP, concept of crystal lattice, unit cell, lattice parameter.
CO4:	Explain X-Ray diffraction and Bragg's Law.

COMPLEMENTARY PHYSICS FOR CHEMISTRY (PRACTICAL)

SEMESTER I & II

PH2CMP01 – Complementary Physics Practical 1

At the end of this course, a student will have developed ability to:

CO1:	Understand the use of vernier callipers and screw gauge.
CO2:	Measure refractive index using spectrometer and liquid lens arrangement.
CO3:	Analyse surface tension and viscosity of liquids.
CO4:	Measure Young's modulus and rigidity modulus of materials.
CO5:	Determine the wavelength of laser using grating.

SEMESTER III & IV

PH4CMP02 – Complementary Physics Practical 2

At the end of this course, a student will have developed ability to:

CO1:	Measure acceleration due to gravity at a place.
CO2:	Measure dispersive power of prism and grating using spectrometer.
CO3:	Characterise zener diode, measurement of magnetic moment.
CO4:	Verify truth tables of logic gates.