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St.Mary'S College

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Learning Outcomes 2018-19

ST.MARY'S COLLEGE
Wayanad Dist.
Kerala
SULTHAN BATHERY-673 592

PRINCIPAL
ST. MARY'S COLLEGE
SULTHAN BATHERY
WAYANAD-673 592

BSc Physics

CORE COURSE

Programme Specific Outcomes

PSO1: Understand the basic concepts of methodology of science and the fundamentals of mechanics, properties of matter and electrodynamics

PSO2: Understand the theoretical basis of quantum mechanics, relativistic physics, nuclear physics, optics, spectroscopy, solid state physics, astrophysics, statistical physics, photonics and thermodynamics

PSO3: Understand and apply the concepts of electronics in the designing of different analog and digital circuits

PSO4: Understand the basics of computer programming and numerical analysis
PSO5: Apply and verify theoretical concepts through laboratory experiments

Semester 1 Core Course I

PHY1B01: METHODOLOGY OF SCIENCE AND BASIC MECHANICS

CO1	Understand the features, methods and limitations of science
CO2	Understand and apply the basic concepts of Newtonian Mechanics to physical systems
CO3	Understand and apply the basic idea of work-energy theorem to physical systems
CO4	Understand and apply the rotational dynamics of rigid bodies
CO5	Understand the basic ideas of elasticity

Semester 2 | Core Course II

PHY2B02: MECHANICS

CO1	Understand the features of non-inertial systems and fictitious forces
CO2	Understand and analyze the features of central forces with respect to planetary motion
CO3	Understand the basics ideas of harmonic oscillations
CO4	Understand and analyze the basics concepts of wave motion

Semester 3 | Core Course III

PHY3B03: ELECTRODYNAMICS I

CO1	Understand and apply the fundamentals of vector calculus
CO2	Understand and analyze the electrostatic properties of physical systems
CO3	Understand the mechanism of electric field in matter.
CO4	Understand and analyze the magnetic properties of physical systems

CO5	Understand the mechanism of magnetic field in matter.

Semester 4 | Core Course IV

PHY4B04: ELECTRODYNAMICS II

CO1	Understand the basic concepts of electrodynamics
CO2	Understand and analyze the properties of electromagnetic waves
CO3	Understand the behavior of transient currents
CO4	Understand the basic aspects of ac circuits
CO5	Understand and apply electrical network theorems

Semester 5 Core Course –VI

PHY5B06: COMPUTATIONAL PHYSICS

CO1	Understand the Basics of Python programming
CO2	Understand the applications of Python modules
CO3	Understand the basic techniques of numerical analysis
CO4	Understand and apply computational techniques to physical problems

Semester 5 Core Course –VII

PHY5B07: QUANTUM MECHANICS

CO1	Understand the particle properties of electromagnetic radiation
CO2	Describe Rutherford – Bohr model of the atom
CO3	Understand the wavelike properties of particles

CO4	Understand and apply the Schrödinger equation to simple physical systems
CO5	Apply the principles of wave mechanics to the Hydrogen atom

Semester 5 | Core Course VIII

PH5B08: OPTICS

CO1	Understand the fundamentals of Fermat‟ s principles and geometrical optics
CO2	Understand and apply the basic ideas of interference of light
CO3	Understand and apply the basic ideas of diffraction of light
CO4	Understand the basics ideas of polarization of light
CO5	Describe the basic principles of holography and fibre optics

Semester 5 Core Course –IX

PHY5B09: ELECTRONICS (ANALOG & DIGITAL)

CO1	Understand the basic principles of rectifiers and dc power supplies
CO2	Understand the principles of transistor
CO3	Understand the working and designing of transistor amplifiers and oscillators
CO4	Understand the basic operation of Op – Amp and its applications
CO5	Understand the basics of digital electronics

Semester 6 | Core Course X

PHY6B10: THERMODYNAMICS

CO1	Understand the zero and first laws of thermodynamics
CO2	Understand the thermodynamics description of the ideal gas
CO3	Understand the second law of thermodynamics and its applications
CO4	Understand the basic ideas of entropy
CO5	Understand the concepts of thermodynamic potentials and phase transitions

Semester 6 Core Course XI

PHY6B11: STATISTICAL PHYSICS, SOLID STATE PHYSICS, SPECTROSCOPY & PHOTONICS

CO1	Understand the basic principles of statistical physics and its applications
CO2	Understand the basic aspects of crystallography in solid state physics
CO3	Understand the basic elements of spectroscopy
CO4	Understand the basics ideas of microwave and infra red spectroscopy
CO5	Understand the fundamental ideas of photonics

Semester 6 □Core Course XII

PHY6B12: NUCLEAR PHYSICS AND PARTICLE PHYSICS

CO1	Understand the basic aspects of nuclear structure and fundamentals of radioactivity
CO2	Describe the different types of nuclear reactions and their applications
CO3	Understand the principle and working of particle detectors
CO4	Describe the principle and working of particle accelerators
CO5	Understand the basic principles of elementary particle physics

Semester 6 | Core Course XIII

PHY6B13: RELATIVISTIC MECHANICS AND ASTROPHYSICS

CO1	Understand the fundamental ideas of special relativity
CO2	Understand the basic concepts of general relativity and cosmology
CO3	Understand the basic techniques used in astronomy
CO4	Describe the evolution and death of stars
CO5	Describe the structure and classification of galaxies

Semester 6 | Core Course XIV (Elective)

PHY6B14 (EL3): MATERIALS SCIENCE

CO1	Understand the basic ideas of bonding in materials
CO2	Describe crystalline and non crystalline materials
CO3	Understand the types of imperfections nad diffusion mechanisms in solids
CO4	Describe the different properties of ceramics and polymers
CO5	Describe the different types of material analysis rechniques

Semesters 1 to 4 | Core Course V

PHY4B05: PRACTICAL I

CO1	Apply and illustrate the concepts of properties of matter through experiments
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments
CO3	Apply and illustrate the concepts of optics through experiments
CO4	Apply and illustrate the principles of electronics through experiments

Semesters 5-6 | Core Course XV

PHY6B15: PRACTICAL II

CO1	Apply and illustrate the concepts of properties of matter through experiments
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments
CO3	Apply and illustrate the concepts of optics and spectroscopy through experiments
CO4	Apply and illustrate the principles of heat through experiments

Semester 5-6 | Core Course XVI

PHY6B16: PRACTICAL III

CO1	Apply and illustrate the principles of semiconductor diode and transistor through experiments
CO2	Apply and illustrate the principles of transistor amplifier and oscillator through experiments
CO3	Apply and illustrate the principles of digital electronics through experiments
CO4	Analyze and apply computational techniques in Python programming

Semester 5-6 | Core Course XVII

Course: PHY6B17(P) – PROJECT

CO1	Understand research methodology
CO2	Understand and formulate a research project
CO3	Design and implement a research project
CO4	Identify and enumerate the scope and limitations of a research project

Semester 5 Open Course I

PHY5D01(2): AMATEUR ASTRONOMY AND ASTROPHYSICS

CO1	Describe the history and nature of astronomy as a science
CO2	Understand the motion of earth in space and the cause of seasons
CO3	Understand the basic elements of solar system
CO4	Understand the elementary concepts of solar system

Complementary Course

Semester 1 Complementary course-I

PHY1C01: Properties of matter & Thermodynamics

CO1	Understand the basic principles of elasticity
CO2	Understand the concepts of surface tension
CO3	Understand the aspects of viscosity
CO4	Understand the basic principles of thermodynamics

Semester 2 | Complementary Course II

PHY2C02: Optics, Laser & Electronics

CO1	Understand the basic concepts of interference and diffraction
CO2	Understand the concepts of polarization
CO3	Understand the fundamentals of electronics
CO4	Understand the important principles of laser physics

Semester 3 | Complementary Course III

PHY3C03: Mechanics, Relativity, Waves and Oscillations

CO1	Understand the basic ideas of frames of reference and the principles of conservation of energy and momentum
CO2	Understand the concepts of relativity
CO3	Understand the basic ideas of oscillations and waves
CO4	Understand the basic ideas of modern physics

Semester 4 | Complementary Course IV

PHY4C04: Electricity, Magnetism and Nuclear physics

CO1	Understand the basic ideas of static and current electricity
CO2	Understand the concepts of magnetism
CO3	Describe the fundamental concepts of nuclear physics
CO4	Understand the basic ideas of cosmic rays and elementary particles

Semester 1 to 4 | Complementary Course V

PHY4C05: PRACTICALS I

CO1	Apply and illustrate the concepts of properties of matter through experiments
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments
CO3	Apply and illustrate the concepts of optics through experiments
CO4	Apply and illustrate the principles of electronics through experiments

MSc Physics

SEMESTER I

PHY1C02 : MATHEMATICAL PHYSICS

To make students have an idea of vector, matrices and tensors, it's physical interpretation and applications. To understand the different methods of solving second order differential equations and understand special functions applicable to different physical systems. Introduce the concepts of Laplace and Fourier transforms.

PHY1C01 : CLASSICAL MECHANICS

To understand the fundamental concepts of the Lagrangian and the Hamiltonian methods and will be able to apply them to various problems; (ii) understand the physics of small oscillations and the concepts of canonical transformations and Poisson brackets ; (iii) understand the basic ideas of central forces and rigid body dynamics; (iv) understand the Hamilton-Jacobi method and the concept of action-angle variables. This course aims to give a brief introduction to the Lagrangian formulation of relativistic mechanics.

PHY1C03: ELECTRODYNAMICS AND PLASMA PHYSICS

Electromagnetic force is one of the four forces that exist in nature with a prominent role in the daily activities of human being. So it is necessary to know the physics of this force from the basics of two inter twinned phenomena called electricity and magnetism. Hence the course aims to impart proper understanding of electricity magnetism and electrodynamics; wave nature of electromagnetic field and its properties; electromagnetic field radiating out of accelerated charges and the impact of relativity in electromagnetism along with confined propagation of electromagnetic wave.

PHY1C04: ELECTRONICS

Electronics is the study of the flow of charge (electron) through various materials and devices such as semiconductors, resistors, inductors, capacitors, nanostructures etc. All applications of electronics involve the transmission of power and possibly information. To understand mainly basic structure of FET and opamp and their applications. To understand digital electronics including flip-flops, registers and counters.

SEMESTER II

PHY2C06: MATHEMATICAL PHYSICS-II

To understand complex variables ,group theory and formulation of variational equations, different methods of solving integral equations and solving non-homogenous equation by Green's function. Introduce the concepts of Laplace and Fourier transforms. Introduce the Fourier series and it's application to solutions of partial differential equations.

PHY2C05: QUANTUM MECHANICS-I

This course aims to develop the basic structure of quantum Mechanics. After completing the course, the student will (i) understand the fundamental concepts of the Dirac formalism (ii) understand how quantum systems evolve in time; (iii) understand the basics of the quantum theory of angular momentum. Also, this course enable the student to solve the hydrogen atom problem which is a prelude to more complicated problems in quantum mechanics.

PHY2C07: STATISTICAL MECHANICS

To understand the concepts of ensembles and the formulation of quantum statistics applicable to bose and Fermi system.

PHY2C08 : COMPUTATIONAL PHYSICS

To help the students to have the basic idea about the techniques used in physics to solve problems with the help of computers when they cannot be solved analytically with pencil and paper since the underlying physical system is very complex. After the completion of this course students might be able to develop their own Algorithms of every method described in the syllabus.

SEMESTER III

PH010301: QUANTUM MECHANICS-II

This course aims to extend the concepts developed in the course ' Quantum Mechanics-I . After completing this course, the student will (i) understand the different stationary state approximation methods and be able to apply them to various quantum systems; (ii) understand the basics of time-dependent perturbation theory and its application to semi-classical theory of atom-radiation interaction; (iii) understand the theory of identical particles and its application to helium; (iv) understand the idea of Born approximation and the method of partial waves. Also, this course will introduce the student to the basic concepts of relativistic quantum mechanics.

PHY3C10 : NUCLEAR AND PARTICLE PHYSICS

This course aims to provide the student to build up the fundamentals of nuclear and particle physics. After undergoing this course, the student will have a knowledge about (1) the basic properties of the nucleus and the nuclear forces. (2) Major models of the nucleus and the theory behind the nuclear decay process; (3) the physics of nuclear reactions (4)the interaction between elementary particles and

the conservation laws in particle physics. This course intents to impart some idea about nuclear physics and the practical applications of nuclear physics.

PHY3C11: SOLID STATE PHYSICS

The objectives of this subject are to challenge the students to expand their knowledge of condensed matter physics and provide a foundation for further advanced studies. To develop a deep understanding of how condensed matter is characterised on the atomic scale.To broaden their appreciation of how condensed matter physics integrates into the discipline of physics overall.To understand the systems and acquire a fundamental understanding of a range of physical phenomena in condensed matter systems. Also to understand the phenomenon of superconductivity and their relation with the magnetic properties of materials.

PHY3E04: DIGITAL SIGNAL PROCESSING(ELECTIVE)

To study about discrete time systems and to learn about FFT algorithms. To study the design techniques for FIR and IIR digital filters.

SEMESTER IV

PHY4C12: ATOMIC AND MOLECULAR SPECTROSCOPY

This course isintented to develop the basic philosophy of spectroscopy. Its aims to equip the student with the understanding of (1)atomic structure and spectra of typical one- electron and two-electron systems. (2)the theory of microwave and infra-red spectroscopies as well as the electronic spectroscopy of molecules;(3)the basics of Raman spectroscopy and the nonlinear Raman effects; (4)the spin resonance spectroscopies such as NMR and ESR. This course also introduces the student to the ideas of Mossbauer spectroscopy

PHY4E20: MICROPROCESSORS, MICROCONTROLLERS AND APPLICATIONS

The objective of the course is to expose to the students to the architecture and instruction set of basic microprocessors. This course also covers fundamentals of semiconductor devices and their processing steps in detail. The student will be able to use the knowledge of semiconductor fabrication processes to work in industry in the area of semiconductor devices.

PHY4E11: MATERIALS SCIENCE

To understand the imperfections in crystals and to understand the methods of crystal growth techniques of nanomaterials and their characterization.