2019 Admission Onwards (BSc Physics)

Programme Outcomes

PO 1.Critical Thinking:

1.1. Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.

1.2. Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.

1.3 Develop self-critical abilities and the ability to view positions, problems and social issues from plural perspectives.

PO 2.Effective Citizenship:

2.1. Learn to participate in nation-building by adhering to the principles of sovereignty of the nation, socialism, secularism, democracy and the values that guide a republic.

2.2. Develop and practice gender-sensitive attitudes, environmental awareness, empathetic social awareness about various kinds of marginalisation and the ability to understand and resist various kinds of discriminations.

2.3. Internalise certain highlights of the nation‘s and region‘s history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post-colonial society.

PO 3.Effective Communication:

3.1. Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language.

3.2. Learn to articulate, analyse, synthesise, and evaluate ideas and situations in a well-informed manner.

3.3. Generate hypotheses and articulate assent or dissent by employing both reason and creative thinking.

PO 4.Interdisciplinarity:

4.1. Perceive knowledge as an organic, comprehensive, interrelated and integrated faculty of the human mind.

4.2. Understand the issues of environmental contexts and sustainable development as a basic interdisciplinary concern of all disciplines.

4.3. Develop aesthetic, social, humanistic and artistic sensibilities for problem-solving and evolving a comprehensive perspective.

Programme Specific Outcomes

PSO1: Understand and apply the principles of Classical mechanics, Quantum mechanics, Thermodynamics, Nuclear physics and Electrodynamics.

PSO 2: Understand and apply the principles of Solid state physics, Optics, Photonics and Spectroscopy.

PSO 3: Understand the principles of Electronics, Design and test electronic circuits.

PSO 4: Understand and apply the principles of Mathematical Physics and Computational Physics and do Error analysis in measurements.

Course Outcome

Sl. No.	Name of Course (paper)	Outcomes	
1	CORE COURSE I: MECHANICS I	i	Understand Newton's laws of motion, the concepts of linear and angular momentum and torque
		ii	Determine the Centre mass of a given configuration
		iii	Understand the principle of work, energy and power
		iv	Determine angular momentum of a body about any given axis
2	CORE COURSE II:MATHEMATICAL PHYSICS AND ERROR ANALYSIS	i	Understand vector operations and vector algebra
		ii	Determine derivative and integral of various functions
		iii	State fundamental theorems of calculus
		Iv	Compare differential operators in various coordinate systems
		v	Understand the basic concepts of modelling
		Vi	Solve first order and second-order ODEs
		vii	Estimate uncertainties in measured values
3	CORE COURSE III: MECHANICS II	i	Understand the concept of Galilean transformations and uniformly accelerating systems
		ii	Determine the trajectory of a body in central force problem using Newton's laws
		iii	Understand Kepler's laws of planetary motion
		Iv	Formulate the mathematical equation of waves
		v	Understand the concept and consequences of special theory of relativity
4	CORE COURSE IV: ELECTRONICS I	i	Understand the basics of PN junction diode, Zener diode and their applications
		ii	Understand the structure, operations and characteristics of BJT and FET
		iii	Understand the biasing methods and design of BJT and FET circuits
		Iv	Understand the different number systems, conversions and binary arithmetic operations
		v	Understand the basic combinational logic gates

5	CORE COURSE V: - GENERAL PHYSICS PRACTICAL I	i	Familiarize with apparatus for mechanical, electrical, magnetic and optical experiments.
		ii	Develop skill in setting up an apparatus for accurate measurement of physical quantities.
		iii	Understand multiple experimental techniques for determining physical quantities.
		Iv	Develop skill in a systematic way of measurements by minimizing possible errors.
		v	Develop the skill to analyze by plotting graphs using the software.
		Vi	Develop skill for systematic troubleshooting.
		vii	Perform error analysis for experiments.
6	CORE COURSE VI: QUANTUM MECHANICS	i	Understand the limitations of classical mechanics
		ii	Explain Blackbody radiation problem, Photoelectric effect and Compton Effect using quantum theory of radiation
		iii	Understand Rutherford, Bohr atom models and concept of energy and angular momentum quantisation
		Iv	Understand de-Broglie hypothesis, the concept of wave nature of matter and Heisenberg uncertainty principle
		v	Determine the probability of finding a particle and expectation values of variable using its wave function
		Vi	State and explain Pauli's exclusion principle
7	CORE COURSE VII: ELECTROSTATICS AND MAGNETOSTATICS	i	Understand the concept of Electric field, electric potential, magnetic field and magnetic potentials
		ii	Use the principle of superposition and law of Gauss to calculate electric field Intensity
		iii	Determine Electric potential of charge distributions and hence specify electric field intensity
		Iv	Understand the basic properties of conductors and capacitors
		v	Calculate the magnetic fields due to currents using Biot-Savart and Ampere laws.

		Vi	Compare Magnetostatics and Electrostatics.
8	CORE COURSE VIII: THERMODYNAMICS AND STATISTICAL MECHANICS	i	Understand the concept of temperature, the thermodynamic state and equilibrium.
		ii	Explain the first law of thermodynamics through work and heat and its Mathematical Formulation.
		iii	Understand the ideal gas equation and the kinetic theory of gases
		Iv	Understand the second law of thermodynamics and thermodynamic temperature scale.
		v	Define entropy and thermodynamic potentials
9	CORE COURSE IX: ELECTRONICS II	i	Understand the AC analysis of BJT circuits and CE amplifiers
		ii	Understand the feedback circuits, oscillators and power amplifiers
		iii	Understand OP AMP basics and different OP AMP circuits
		Iv	Understand the standard forms Boolean Expressions, Functions of Combinational Logic and K map simplifications.
10	CORE COURSE X: SOLID STATE PHYSICS & SPECTROSCOPY	i	Understand basic crystal structure and compare various crystal systems
		ii	State and prove Bragg's law
		iii	Explain X-ray diffraction and various methods to obtain a diffraction pattern
		Iv	Understand basic properties of semiconductors and band structure of solids
		v	Discuss Hall Effect and list its applications
		Vi	Describe various regions of EM spectrum
11	CORE COURSE XI : OPTICS &PHOTONICS	i	Understand the concept of interference and diffraction
		ii	Distinguish between Fresnel and Fraunhoffer diffraction
		iii	Analyse mathematically diffraction pattern due to slits and apertures
		Iv	Understand the concept of polarization and double refraction
		v	Understand the basic principle and working of lasers
		Vi	Explain different types of lasers

12	CORE COURSE XII	i	Understand the structure nucleus and nuclear constituents
		ii	Define nuclear forces and nuclear reactions
		iii	Familiarize elementary particles and their properties
		Iv	Understand stellar classifications
		v	Understand basic concepts of the birth of the star
		Vi	Identify different stars in HR diagram
		vii	Understand the theory of the death of the star
13	CORE COURSE XIII : ELECTRODYNAMICS AND CIRCUIT THEORY	i	Understand the basic concepts of Electrodynamics
		ii	Explain the mathematical theory of Electromagnetic waves
		iii	Understand different Network theorems
		Iv	Understand the basic concepts of Transient currents
14	6B14PHY(1).PYTHON PROGRAMMING	i	Develop skills in creating program sketches of scientific problems
		ii	Develop basic skills in logical thinking and programming
		iii	To make real-life scientific problems easier on a computer with user interaction and graphics
15	6B14PHY(2) NANOSCIENCE	i	Understand the basic concepts of Nanoscience
		ii	Understand the properties of materials in the nano range
		iii	Identify different techniques for the production of nanomaterials
		Iv	Understand characterization techniques & applications of nanomaterial
16	6B14PHY(3) MATERIAL SCIENCE	i	Understand the basic concepts of material science
		ii	Understand the properties of materials
		iii	Identify different engineering materials & their properties
		Iv	Understand the properties & characteristics of semiconducting, insulating & magnetic materials
17	6B14PHY (4): COSMOLOGY	i	Understand the history of cosmology at a different era

		ii	Explain the general theory of relativity and curvature of space
		iii	Understand cosmological principle and Friedmann model
		Iv	Explain the expansion of the universe based on Hubble's law and state big bang theory
18	6B14 PHY(5) PLASMA PHYSICS	i	Define plasma and plasma parameters
		ii	Understand applications of plasma
		iii	Determine the nature of plasma as a fluid
19	CORE COURSE XV: Practical II General Physics II	i	Familiarise with apparatus for mechanical, electrical, magnetic and optical experiments.
		ii	Develop skill in setting up apparatus for accurate measurement of physical quantities.
		iii	Understand multiple experimental techniques for determining physical quantities.
		Iv	Develop skill in a systematic way of measurements by minimising possible errors.
20	CORE COURSE XVI: PRACTICAL III ELECTRONICS	i	Familiarise with active and passive electronic components.
		ii	Familiarise multimeter, power supply, signal generator and cathode-ray oscilloscope.
		iii	Develop skill in soldering and use of the breadboard.
		Iv	Develop skill in the construction of rectifiers, voltage regulators, amplifiers and oscillators.
21	6B17 PHY PROJECT	i	To develop investigation aptitude in Physics/Life. Selection of the topic for the project must be based on the physics (theory/experimental) they have learned through Semesters I to IV.
22	COMPLEMENTARY ELECTIVE COURSE I: -MECHANICS	i	Understand the basic concepts of Properties of matter
		ii	Explain the dynamics of rigid bodies.
		iii	Understand the basic concepts of wave motion and oscillations
23	COMPLEMENTARY ELECTIVE COURSE II: ELECTRICITY, MAGNETISM	i	Understand the basic concepts of Magnetism & electricity
		ii	Explain the magnetic effects of electric currents

	AND THERMODYNAMICS	iii	Understand the basic principles of Thermodynamics
24	COMPLEMENTARY ELECTIVE COURSE III: OPTICS AND PHOTONICS	i	Understand the basic concepts of Interference
		ii	Understand the basic concepts of Diffraction
		iii	Understand the basic concepts of Polarization
		Iv	Understand the basic concepts of Photonics and Fibre Optics
25	COMPLEMENTARY ELECTIVE COURSE IV: ELECTRONICS AND MODERN PHYSICS	i	Understand the basic concepts of Basic electronics
		ii	Understand the basic concepts of Digital electronics
		iii	Understand the basic concepts of Nuclear Physics
		Iv	Understand the basic concepts of Particle physics and Astrophysics
26	COMPLEMENTARY COURSE V – PHYSICS PRACTICAL	i	Familiarise with apparatus for experiments in mechanics, optics, electricity and magnetism and electronics and electronics experiments.
		ii	Develop skill in setting up apparatus for accurate measurement of physical quantities.
		iii	Understand multiple experimental techniques for determining physical quantities.
		Iv	Develop skill in a systematic way of measurements by minimizing possible errors.
27	5D01PHY: INTRODUCTION TO CLIMATE AND CLIMATE CHANGE SCIENCE	i	Understand the basic concepts of climate change science
		ii	Understand some of the potentially serious consequences of climate change
		iii	Analyse linkages between climate change adaptation and development planning.
		Iv	Describe relevant policy approaches and strategic frameworks for climate change mitigation
28	5D02PHY RENEWABLE ENERGY SOURCES	i	Understand the sources of renewable energy
		ii	Understand the solar energy measurements & their applications
		iii	Understand the wind energy production &applications

		Iv	Identify the energy from biomass, geothermal & ocean
29	5D 03 PHY: BIOPHYSICS	i	Understand the application of Physics in Biology and Medical fields
		ii	Understand about bioelectricity
		iii	Understand the principles behind EEG and ECG
30	5D 04 PHY: JOY OF STAR WATCHING	i	Understand Our Universe and its origin
		ii	Understand simple constellations
		iii	Explain the stars in Kerala culture
31	5D05PHY: ELECTRICITY IN DAILY LIFE	i	Understand the sources of Electricity
		ii	Explain the production of Electricity
		iii	Understand the basic concepts of electricity auditing
32	5D06PHY : INTRODUCTION TO BASIC ELECTRONICS	i	Understand the concepts of Basic electronics.
		ii	Explain the Semiconductor diode
		iii	Understand the basic electronic measurements and the instruments.

Programme Outcome, Programme Specific Outcome and Course Outcome

Name of the Department: PHYSICS

2014-2018 Admission (BSc Physics)

Programme Outcomes

Critical Thinking:

Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.

Develop self-critical abilities and the ability to view positions, problems and social issues from plural perspectives.

Effective Citizenship:

Develop and practice gender-sensitive attitudes, environmental awareness, empathetic social awareness about various kinds of marginalisation and the ability to understand and resist various kinds of discriminations.

Internalise certain highlights of the nation‘s and region‘s history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post-colonial society.

Effective Communication:

Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language.

Learn to articulate, analyse, synthesise, and evaluate ideas and situations in a well-informed manner.

Generate hypotheses and articulate assent or dissent by employing both reason and creative thinking.

Programme Specific Outcomes

The design of the theory syllabus is to lay the foundations of physics by learning the history, concepts involved, its language (mathematics), problem-solving, and theoretical/experimental developments in various branches of Physics.

Understand and apply the principles of Electronics, Classical mechanics, Quantum mechanics, Thermodynamics, Nuclear physics and Electrodynamics.

Understand and apply the principles of Solid state physics, Optics, Photonics and Spectroscopy.

Understand the principles of Electronics, Design and test electronic circuits.

It also aims at the needs that an employer expects from a physics graduate/ to prepare them for scientific research.

Course Outcome

Sl. No.	Name of Course (paper)	Outcomes	
1	1B01PHY: Physics Primers	1	What does physics deal with?
		2	Explain the Semiconductor revolution in physics
		3	What is Nanotechnology?
		4	Understand vector operations and vector algebra
		5	Determine derivative and integral of various functions
		6	State fundamental theorems of calculus
		7	Compare differential operators in various coordinate systems
2	2B02PHY: Electronics I	1	Understand the structure, operations and characteristics of BJT and FET
		2	Understand the biasing methods and design of BJT and FET circuits
		3	Understand the different number systems, conversions and binary arithmetic operations
		4	Understand the basic combinational logic gates
3	3B03PHY: Allied physics	1	Understand different Network theorems
		2	Understand the basic concepts of Transient currents

		3	Understand the basic concepts of material science
		4	Understand the properties of materials
		5	Identify different engineering materials & their properties
		6	Understand the properties & characteristics of semiconducting, insulating &magnetic materials
4	4B04PHY: Optics	1	Distinguish between Fresnel and Fraunhoffer diffraction
		2	Analyse mathematically diffraction pattern due to slits and apertures
		3	Understand the concept of polarization and double refraction
		4	Understand the basic principle and working of lasers
		5	Understand the concept of interference and diffraction
		6	Distinguish between Fresnel and Fraunhoffer diffraction
		7	Analyse mathematically diffraction pattern due to slits and apertures
5	4B05PHY: Practical – I	1	Understand multiple experimental techniques for determining physical quantities.
		2	Develop skill in systematic way of measurements by minimizing possible errors.
		3	Develop skill to analyze by plotting graphs using software.
		4	Develop skill for systematic trouble shooting.
		5	Perform error analysis for experiments.
6	5B06PHY: Electrodynamics-I	1	Understand the concept of Electric field, electric potential, magnetic field and magnetic potentials
		2	Use the principle of superposition and law of Gauss to calculate electric field Intensity
		3	Determine Electric potential of charge distributions and hence specify electric field intensity
		4	Understand the basic properties of conductors and capacitors
		5	Calculate the magnetic fields due to currents using Biot-Savart and Ampere laws.
		6	Compare Magnetostatics and Electrostatics.
7	5B07PHY: Thermal Physics	1	Understand the concept of temperature ,the thermodynamic state and equilibrium.

		2	Explain the first law of thermodynamics through work and heat and its Mathematical Formulation.
		3	Understand the ideal gas equation and kinetic theory of gases
		4	Understand the second law of thermodynamics and thermodynamic temperature scale.
8	5B08PHY: Classical mechanics & Relativity	1	Background of Michelson-Morley Experiment
		2	Examples of conservation of angular momentum
		3	Lagrangian formulation
9	Core IX: 5B09PHY Python programming	1	Develop skills in creating program sketches of scientific problems
		2	Develop basic skills in logical thinking and programming
		3	To make real-life scientific problems easier on a computer with user interaction and graphics
10	5B10PHY: Atomic, Nuclear & Particle physics	1	Understand the structure nucleus and nuclear constituents
		2	Define nuclear forces and nuclear reactions
		3	Familiarize elementary particles and their properties
11	6B11PHY: Electrodynamics-II	1	Understand the basic concepts of Electrodynamics
		2	Explain the mathematical theory of Electromagnetic waves
		3	Applications of Static Fields & Time Varying Electromagnetic Fields
12	6B12PHY: Photonics & Spectroscopy	1	Understand the basic principle and working of lasers
		2	Explain different types of lasers
13	6B13PHY: Quantum mechanics	1	Explain Blackbody radiation problem, Photoelectric effect and Compton Effect using quantum theory of radiation
		2	Understand Rutherford, Bohr atom models and concept of energy and angular momentum quantisation
		3	Understand de-Broglie hypothesis, concept of wave nature of matter and Heisenberg uncertainty principle
		4	Determine probability of finding a particle and expectation values of variable using its wave function
		5	State and explain Pauli’s exclusion principle

14	6B14PHY: Electronics- II	1	Understand the feedback circuits, oscillators and power amplifiers
			Understand OPAMP basics and different OPAMP circuits
			Understand the standard forms Boolean Expressions, Functions of Combinational Logic and K map simplifications.
15	6B15PHY(Elective):A. Plasma physics	1	Concept of temperature, Debye shielding
		2	Understand the production of plasma through collisions
		3	Determination of particle in a non-magnetic electric field and uniform magnetic field
		4	Waves in a Fluid plasma
16	6B15PHY(Elective): B. Astronomy & Astrophysics	1	Understand stellar classifications
		2	Understand basic concepts of birth of the star
		3	Identify different stars in HR diagram
		4	Understand the theory of death of the star
17	6B15PHY(Elective): C.Atmospheric Physics	1	Understand the Planetary atmosphere
		2	Concept of Green house effect, Black body radiation
		3	What is Raleigh and Mie scattering
16	6B15PHY(Elective):D.Nanoscience	1	Understand the basic concepts of Nanoscience
		2	Understand the properties of materials in the nano range
		3	Identify different techniques for the roduction of nanomaterials
		4	Understand characterization techniques & applications of nanomaterial
17	6B15PHY(Elective):E. Material science	1	Understand the basic concepts of material science
		2	Understand the properties of materials
		3	Identify different engineering materials & their properties
		4	Understand the properties & characteristics of semiconducting, insulating & magnetic materials
18	6B15PHY(Elective):F. Computational physics	1	Introduction to C programming
		2	Introduction to Fortan-77 language
		3	Numerical approach to physical problems
19	6B16PHY: Practical –II	1	Familiarise with apparatus for mechanical, electrical, magnetic and optical experiments.
		2	Develop skill in setting up an apparatus for accurate measurement of physical quantities.

		3	Understand multiple experimental techniques for determining physical quantities.
		4	Develop skill in a systematic way of measurements by minimising possible errors.
20	6B17PHY: Practical-III	1	Familiarise with active and passive electronic components.
		2	Familiarise multimeter, power supply, signal generator and cathode-ray oscilloscope.
		3	Develop skill in soldering and use of the breadboard.
		4	Develop skill in the construction of rectifiers, voltage regulators, amplifiers and oscillators.
21	6B18PHY: Project	1	To develop investigation aptitude in Physics/Life. Selection of the topic for the project must be based on the physics (theory/experimental) they have learned through Semesters I to IV.
22	1C01PHY: Mechanics	1	Understand Newton's laws of motion, the concepts of linear and angular momentum and torque
		2	Determine the Centre mass of a given configuration
		3	Understand the principle of work, energy and power
		4	Determine angular momentum of a body about any given axis
23	2C02PHY: Electricity, Magnetism and Thermal Physics	1	Understand the basic concepts of Magnetism & electricity
		2	Explain the magnetic effects of electric currents
		3	Understand the basic principles of Thermodynamics
24	3C03PHY: Optics and Photonics	1	Understand the concept of interference and diffraction
		2	Distinguish between Fresnel and Fraunhoffer diffraction
		3	Analyse mathematically diffraction pattern due to slits and apertures
		4	Understand the concept of polarization and double refraction
		5	Understand the basic principle and working of lasers
		6	Explain different types of lasers
25	4C04PHY: Modern Physics and Electronics	1	Understand basic crystal structure and compare various crystal systems State and prove Bragg's law

			Define nuclear forces and nuclear reactions
		2	Understand the basic concepts of Transient currents
		3	Understand different Network theorems
		4	Understand the theory of the death of the star
		5	Identify different stars in HR diagram
		6	Understand basic concepts of the birth of the star
		7	Understand stellar classifications
		8	Familiarize elementary particles and their properties
26	4C05PHY: Practical	1	Familiarise with apparatus for experiments in mechanics, optics, electricity and magnetism and electronics and electronics experiments.
		2	Develop skill in setting up apparatus for accurate measurement of physical quantities.
		3	Understand multiple experimental techniques for determining physical quantities.
		4	Develop skill in a systematic way of measurements by minimizing possible errors.
27	5D01PHY: A. Environmental Physics	1	Understand the basic concepts of climate change science
		2	Understand some of the potentially serious consequences of climate change
		3	Analyse linkages between climate change adaptation and development planning.
		4	Describe relevant policy approaches and strategic frameworks for climate change mitigation
		5	Understand Friction and Air Resistance
		6	Familiarise with the Carnot's Cycle
28	5D01PHY: B. Joy of star watching	1	Understand Our Universe and its origin
		2	Understand simple constellations
		3	Explain the stars in Kerala culture
29	5D01PHY: C. Disaster Management	1	Understand the challenges for food security
		2	Temporal Transport Hazard Dynamics
		3	Future Applications and challenges of Remote sensing
30	5D01PHY: D. Biophysics	1	Types of muscles
		2	Familiarise of Radiation bio-physics:
		3	What is Biomedical instrumentation