## Department of Physics
## Programme Name - B.Sc. (Physics)

## Programme Outcomes

### Knowledge Outcomes

After completing B.Sc. (Physics) Programme students will be able to:

1. Apply the basic principles of Physics to the events occurring around us and also in the world.
2. Try to find out or analyze scientific reasoning for various things.

### Skill Outcomes

After completing B.Sc. (Physics) Programme students will be able to:

1. Use computers and various software and acquire programming skills
2. apply the knowledge to develop the sustainable and eco-friendly technology for pollution free environment
3. collaborate effectively on team-oriented projects in the field of Physics
4. Communicate scientific information in a clear and concise manner both orally and in writing or through audio video presentations

### Generic outcomes

Students will

1. develop ability to work in group
2. develop capacity of critical reasoning, judgment and communication skills.
3. Develop abilities for logical thinking

## Programme Specific Outcomes

PSO1: Students get acquainted with techniques which are useful in industry.

PSO2: Students get conceptual knowledge of entrepreneurships through the co-curricular activities

PSO3: learn the organizational skills and working in group.

PSO4: Students will be well versed with use of computers

## Course outcomes

**In each course students will learn different concepts and theories as mentioned below.**

## First Year 2019 (CBCS) PATTERN

### Semester I

**Course- PHY 111- Mechanics and Properties of Matter**

CO1: Application of Newton's laws of motion to solve various problems related to day today life.

CO2: Concepts like zero work done, conservative forces, mass energy equivalence ($E= mc^2$).

CO3: Effect of force on various types of materials is described and physical properties like elasticity, different moduli etc. along with their relation.

CO4: Examples of surface tension in nature and its applications in our day to day life.

CO5: Concept of viscosity of fluids, Bernoulli's Equation and its applications.

**Course- PHY 112- Physics Principles and Applications**

CO1: Students learn about an atom is made up of protons, neutrons and electron, how they arranged to make up an atom. They learn different atomic models, Atomic spectrum and types of spectrum.

CO2: Students learn about Different forces which hold atoms together to form a molecule.

Different types of chemical and physical bonds like ionic, covalent, Van der Waal's bonds. Energy levels of rotational and vibrational diatomic molecule.

CO3: Students will identify and compare the characteristics of electromagnetic spectrum including speed, wavelength and frequency.

CO4: students will learn common uses and applications of electromagnetic waves.

CO5: students will learn basic principles of Laser, excitation and de-excitation process, pumping scheme, population inversion and metastable state. Characteristics, applications and different types of laser.

### Semester II

**Course - PHY-121- Heat and Thermodynamics**

CO1: To understand various thermodynamic processes like isothermal, isobaric, isochoric processes and laws of thermodynamics.

CO2: To understand the concept of entropy.

CO3:- To understand Carnot's cycle, Heat engines and Refrigerators.

CO4:- To understand Principle of thermometry and various types of thermometers like Liquid filled thermometers, Gas filled thermometers, Bimetallic thermometers, Platinum resistance thermometer

**Course – PHY122 - Electricity and Magnetism**

CO1: Students will be able to understand the concept of the electric force, electric field and electric potential for stationary charges. They are able to calculate electric potential and electric field by using Gauss's law.

CO2: Student will understand the dielectric phenomenon and effect of electric field on dielectric.

CO3: Study the concept of magnetic field, magnetic field for steady currents using Biot-Savart's and Ampere's Circuital laws.

CO4: Student will learn magnetic materials and its properties.

## Second Year (2019 pattern)

### Semester I

**Course: PHY 231 Mathematical Methods in Physics**

The student will be able to

CO1: Studying De Moivre's theorem students will understand how the power of given complex number is calculated.

CO2: Many times students come across the term divergence, curl, gradient but they don't understand their physical meaning. From this course their concept will clear.

CO3: Students can understand what exact use of partial differentiation concept in physics is. .

CO4:Students can also understand what is the need of complex no. is during mathematical calculation

**Course: PHY 232 (A) Electronics**

Students learn about the following topics in this subject

CO1: Various network theorems which use to solve problems related to complicated circuits by converting them into simpler circuits. This has wide applications in electronic and transmission circuits.

CO2: Knowledge about semiconductors since it is a basic materials used in many electronic components like diode, transistors FET, UJT etc.

CO3: Characteristics and working of operational amplifiers which are useful in various medical and scientific investigations to amplify the signals.

CO4:Generation of high frequency signals using oscillator circuits and their applications in radio and TV communication.
CO5:An introduction to digital electronics which is useful in digital computers. Also logic gates and their applications.

**Course :PHY 232 (B) Instrumentation**

Students learn about the following topics in this subject
CO1: History and need of Instrumentation, Components of measurement system, Standards of Measurement, errors in measurement. Importance and methods of calibration. Static and dynamic characteristics of measurements.
CO2: Transduction principle, types of transducers. Use of transducers in measurement of displacement, force and temperature.
CO3: Comparative study of Pressure scales, pressure units, concept of vacuum, Elastic Transducers, Types and use of diaphragms and strain gauges.
CO4:Need and use of signal conditioning. Circuits indicating use of OPAMP for different applications. Like current to voltage converter, voltage to current converter and filters.

**Semester II**

**Course: PHY 241 Waves and Oscillations**

**The student will be able to**
CO1: Studying DeMoivree's theorem students will understand how the power of given complex number is calculated.
CO2: Many times students come across the term divergence, curl, gradient but they don't understand their physical meaning. From this course their concept will clear.
CO3:Students can understand what exact use of partial differentiation concept in physics is. .
CO4:Students can also understand what is the need of complex no. is during mathematical calculation.

**Course: PHY 242 Optics**

**The student will be able to**
CO1:Geometrical optics dealing with lenses and mirrors and image formation
CO2:Defects produced in images formed by lenses like distortion, spherical aberration, Coma, Astigmatism and ways to reduce these defects
CO 3:Construction working and image formation by simple microscope, compound microscope, Huygen's eyepiece and Ramsden Eyepiece
CO 4:Theory of Fringes formed in Interference and diffraction, Formation of Fringes using Newton's ring experiment, resolving power and comparison between Fresnel and Fraunhofer diffraction
CO 5:Concept of polarization, double refraction, Nicol Prism

## Third Year (2013 pattern)

### Semester I

**Course - PH 331- Mathematical Methods in Physics**

CO1: The three commonly used co-ordinate systems and general curvilinear co-ordinate system.

CO2: Concept of relativity, length contraction, relativistic mass, time dilation and twin paradox.

CO3: Various methods to solve different differential equations.

CO4: Properties of Legendre polynomials, Hermite polynomials and Bessel function. These are useful to solve the problem of linear simple harmonic oscillator in quantum mechanics.

**Course - PH 332- Solid State Physics**

CO: Students will able to study difference between crystalline and amorphous material, crystal structures, miller indices, interplaner distances, interatomic forces and bonds.
From this study students get to learn the basics of solid state physics.

CO2: Students will understand Bragg's diffraction, Bragg's law. X-ray diffraction and characterization techniques. With the help of this knowledge students know the principles of structures determination by X-ray diffraction method. This would be helpful in performing experiments in nanotechnology.

CO3: Students can understand electrical and thermal conductivity of free electron in metals, Energy levels of free electrons in one and three dimensions.
They will learn significance of Pauli's exclusion principle, Bloch theorem, Fermi energy, and Hall effect and energy bands in materials.

CO4: Students can Describe and explain the behaviour of permanent magnet including induced magnetism, behaviour of paramagnetic, diamagnetic, ferromagnetic materials in terms of magnetic domain.

CO5: Students can understand superconducting materials, their properties and technological applications of superconductivity.

**Course - PH 333- Classical Mechanics**

CO1: Students will be able to define, present and demonstrate basic mechanical concepts and their applications used in daily life.

CO2: Students can understand the motion of a body, Equations of motions, trajectory of an objects in constant field such as electrical, magnetic field.
With the help of this knowledge students can understand process involved in cathode ray Oscilloscope.

CO3: With the help of this knowledge students will understand how to launch rockets and satellites. Motion of planets and satellites and dynamic molecular collisions. How the mechanical concepts used in sports and military.

CO4: Students will learn Lagrangian and Hamiltonian formulations. Canonical transformation, Passion's Bracket concept.
Using the technique of Lagrangian and Hamiltonian formulation students will explain motions of different bodies in simple form such as kinetic and potential energy.

CO5: Students can learn Newton's laws such as projectile motion and rocket motion. Also Kepler's laws related to motion. Scattering of particles.

CO6: Mathematical and thinking skills will develop among students by solving problems.

**Course - PH 334- Atomic and Molecular Physics**

CO1: There are many atomic models to explain atomic structure. But none of the model explained atomic structure fully. A new model could explain all parameters of atomic structure called vector atom model. Studying this model students can draw vector diagrams easily.

CO2: Students learn how to find out interaction energy from different coupling schemes.

CO3: Students scientifically understand, how the x-rays produced. Also they will understand what precaution should be taken during handling of x- rays.

CO4: By studying molecular spectroscopy students understand the importance rotational and vibrational energy levels.

**Course - PH 335- Computational Physics**

CO1: Learn the Basic Programming Concept.

CO2: Improve the logical as well as Computational ability.

CO3: Memory allocation and utilization technique learning.

CO4: Applicability of computer resources in physics.

CO5: Learn Graphical technique using some Graphical Commands in C programming.

**Course - PH 336 B- Elements of Material Science**

CO1: By studying defects in solid, students can identify the defects existing in a given solid.

CO2: Students will learn different polymers and the importance of polymerization in making superior quality polymer.

CO3: Students will understand which type of ceramic material can be used for a particular application.

CO4: Smart materials are newly discovered materials which are useful to human being in day-to-day life. Students will study such advanced materials.

## Third Year- Semester II

**Course - PH 341 - Electrodynamics**

CO1: Understand the basic mathematical concepts related to electromagnetic vector fields.

CO2: Understanding of basic principles and concepts of electromagnetism and magnetostatics

CO3: Learning Maxwell's equations and boundary value problems. Applications of these equations for solving problems.

CO4: Understanding the basics of electromagnetic waves, wave equations in free space and pointing theorem.

**Course - PH 342 - Quantum Mechanics**

CO1: Introduction to Quantum Mechanics, Historical background, Matter Waves, Wave particle duality, Phase and Group Velocity, Heisenberg's Uncertainty Principle

CO2: Physical Interpretation of Wave function, Schrödinger's Wave Equation, Eigen Function and Eigen values

CO3: Free Particle, One Dimensional and Three Dimensional Rigid Box, Potential Barrier

CO4: Spherically symmetric potential, Examples of Rigid Rotor and hydrogen atom

CO5: Hermition and other operators in Quantum Mechanics, Commutator brackets and concept of parity

**Course - PH 343- Thermodynamics and Statistical Physics**

CO1: To study the transport phenomenon such as viscosity, thermal conductivity, diffusion.

CO2: To learn about thermodynamic functions, variables and their relations.

CO3: To acquire the skill of solving problems based of particle distribution.

CO4: To study about types of ensembles viz. Microcanonical, canonical and grand canonical.

CO5: To get the knowledge about Maxwell Boltzmann statistics, Bose Einstein statistics and Fermi Dirac Statistics

**Course - 344- Nuclear Physics**

CO1: Studying Basic properties of nucleus, student got the idea of inner information of the nucleus.

CO2: From radioactivity chapter student knew that which radiations emit from radioactive material and how they are useful and harmful for the human.

CO3: From nuclear force student understood that apart from alpha, beta, gamma particle how many other particles are inside the nucleus.

CO4: Studying molecular spectroscopy students understand the importance rotational and vibrational energy levels.

CO5: Student learnt by using accelerators we can produce high energy particle which can be used for research purpose

CO6: Use of nuclear reactors to produce huge amount of heat energy.

**Course - 345- Electronics**

**Students can learn the design and working of electronics used in different applications.**

CO1: Special Purpose diodes like LED, photodiode, Varactor, Optocoupler

CO2: Amplifiers, Class A, Class B and Class C , Push Pull emitter follower and differential amplifier

CO3: Junction Field Effect Transistor and MOS Field Effect Transistor, Working and applications

CO4: Operational Amplifiers its parameters, characteristics and applications

CO5: 555 timer, Astable, Monostable and Bistable Multivibrator

CO6: Regulated power supply using IC 723

CO7: Combinational Circuits like Adder, Subtractor and Multiplexer, Binary to Gray code conversion

CO8: Sequential Logic Circuits, Flip- Flop, Counters and Shift Register

**Course - PH 346 J- Electroacoustics and Entertainment Electronics**

**Students can learn physics behind architectural acoustics and variety of instruments used in commercial sound recording and reproduction.**

CO1: Human Hearing Mechanism, Human Voice production Mechanism, Theories of Hearing

CO2: Types of Microphones, Construction and working of Microphones, Sensitivity and its directional Characteristics, Types of Loudspeakers, Construction and working, Loudspeaker cabinets

CO3: Architectural acoustics, Reverberation time and concept of Open Window. Studio and Room acoustics

CO4: Sound Equalizers, Compressors, Acoustic Delay, Magnetic Tape recording, CD recording, Hi-Fi systems, Studio Articulation Test

CO5: Ultrasonics and its applications

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