

FYBSC (Sem I)

USPH101 Classical Physics

Unit I

1. Students will be able to apply Newton's law of motion for simple motions in daily life.
2. Use of concept of friction in day to day life
3. Students will be able to analyse numerically the equivalence of energy and work and energy and mass.
4. Developed quantitative problem solving skill.

Unit II

1. Explain the concept of Elasticity,
2. Study elastic behavior of materials.
3. Explain the difference between elasticity and plasticity.
4. Define Stress, Strain,
5. Apply Hooke's Law to obtain Moduli of Elasticity and establish a relation between them.
6. Define Viscosity
7. Derive Poiseuille's Equation for Flow through a Narrow Tube and study its application in daily life.
8. Derive Stokes Law
9. Define terminal velocity, Critical velocity and Reynolds number
10. Apply Stokes' method to Measuring Coefficient of Viscosity
11. Define streamline and turbulent flow and differentiate between them, derive equation of continuity, derive Bernoulli's equation and study their applications in real life problems.

Unit III

1. Student will be able to differentiate ideal gas behaviour versus Real gas.
2. Apply the concepts of thermodynamics in daily life.
3. Developed quantitative problem solving skill.

USPH102 Modern Physics

Unit I

1. Understand nuclear properties, nuclear behavior
2. To derive equation for estimation of the size of nuclei
3. To plot BE graphs and understand
4. Understand the statistical nature of radioactivity, different types of equilibria in radioactive elements

Unit II

1. Student will be able to understand various types of nuclear detectors and their applications.
2. Student will be able to understand various types of nuclear reactions.
3. Student will develop problem solving skill.

Unit III

1. Student will be able to understand the origin of quantum mechanical concepts.
2. Student will be able to understand production, properties and application of X-rays.
3. Student will develop problem solving skill.

FYBSC (Semester II)

USPH201 Optics I

Unit I

1. Discuss thin lenses and the derivation of the lens equation and study their application.
2. Define different types of magnification by lens. Analyze the necessity of lens combination and explain cardinal points and their significance.
3. Identify the defects in images obtained by mirrors and lenses, with their cause and ways of reducing or eliminating them.

Unit II

1. Student will be able to understand the significance of combination of lenses implied to eyepiece of optical instrument.
2. Student will be able to understand interference of light with few well known daily life examples.
3. Student will develop problem solving skill.

Unit III

1. Student will be able to understand LASER and Optical fibers, their applications in day to day life.
2. Student will develop problem solving skill.

USPH202 Electricity & Electronics

Unit I

1. Understand the basic concepts of Alternating current theory
2. Learn about relationship of voltages and current across different components used in electrical circuits
3. Interpret the relationship of voltages, current and impedances in electrical ac circuits comprising of components in series and parallel
4. Learn the condition of balance of the bridges
5. Analysis of different types of AC bridges

Unit II &Unit III

1. Students can apply the knowledge of transistor biasing and general amplifier to design and construct an amplifier.
2. Understand the basics of Analog and Digital Electronics and apply them in real life situations
3. Demonstrate quantitative problem solving skills in all the topics covered

SYBSC (Sem III)

USPH301 Mechanics & Thermodynamics

Unit I

1. to learn one body and two body oscillator,
2. to understand damped and forced oscillations
3. to understand relation between SHM and UCM
4. to understand concept of compound pendulum
5. Learn the relation between lab frame of reference and centre of mass frame and of physical quantities in both the frames

Unit II

1. Student will able to understand the basic concepts of thermodynamics & its applications in physical situation.
2. Student will develop problem solving skill.

Unit III

1. Student will able to understand types of heat engine and their basic mechanism.
2. Student will learn about low temperature and their use in liquefaction of permanent gases.
3. Student will develop problem solving skill.

USPH302 Vector Calculus & Analog Electronics

Unit I

1. Explain line, surface and volume integral and solve problems based on them. Apply it to physics problems.
2. State Divergence, Stokes and gradient theorem and understand their physical significance. Solve problems based on them. Apply it to physics problems.
3. Derive relation between Cartesian and spherical coordinate system and relation between Cartesian and cylindrical coordinate system.

Unit II

1. Students will able to apply the knowledge of transistor biasing and general amplifier to design and construct an amplifier.
2. Demonstrate quantitative problem solving skills

Unit III

1. Apply the knowledge of operational amplifier for home based applications.
2. Demonstrate quantitative problem solving skills

USPH303 Applied Physics I

Unit I

1. Explain the working of lasers, discuss the construction and working of He-Ne lasers, explain application of lasers,
2. Analyze different factors that affect the acoustics of a building and discuss requirement of good auditorium.
3. Explain the principle and construction of an optical fibre. Explain different types of optical fibre and discuss applications of optical fibre in real life.

Unit II &Unit III

1. To study different crystal systems
2. To learn different parameters in order to understand crystallography
3. To learn the method of describing different planes in crystal systems
4. To learn about different types solids based on optical , electrical and magnetic properties
5. To learn applications of dielectric, piezoelectric , ferroelectric and pyroelectric materials

SYBSC (Semester IV)

USPH401 Optics & Digital Electronics

Unit I

1. Student will be able to understand the different types of diffraction phenomenon and its pattern.
2. Student will be able to understand the resolving power of different optical instruments.
3. Student will develop problem solving skill.

Unit II

1. Student will be able to understand polarization processes and its applications in physical situations.
2. Student will develop problem solving skill.

Unit III

1. Explain binary and hexadecimal number system and conversion from one number system to another. Perform binary addition and subtraction. Explain the working of adder-subtractor circuit.
2. Explain the working of various types of flip flops and apply it to build sequential circuits.
3. Define shift registers and explain the working of various types of shift registers.
4. Define counters, explain and differentiate between asynchronous and synchronous counters. Explain the working of different kinds of counters and analyze their application in real life.

USPH402 Quantum Physics

Unit I Unit II

1. To understand in detail wave nature of particles using Schrodinger's equation
2. To derive conditions of quantisation of energy and momentum

Unit III

1. To understand the interaction of particle with potential barrier
2. To understand the quantum tunnelling effect
3. To understand quantum perspective of alpha decay
4. To understand quantum harmonic oscillator
5. To develop problem solving skills.

USPH403 Applied Physics II

Unit I

1. To study application of physics in geophysics
2. To study the internal structure of the earth
3. To understand different theories on formation of the earth, continents
4. To study seismic waves

Unit II

1. Explain the internal architecture of 8085 microprocessor, instruction set of 8085, write simple 8085 programs.

Unit III

1. To understand the concept of radio communication
2. To understand Amplitude modulation
3. To understand Frequency modulation
4. To understand working of radio receiver

TYBSC (Semester V)

USPH501: Mathematical, Thermal and Statistical Physics

1. Solve problems based on probability. Explain and apply probability theorems to solve problems.
2. Solve problems based on complex functions and apply it to solve physics problems and analyze how use of complex numbers simplifies the solution of the problem.
3. Solve problems based on differential equations and apply it to solve physics problems.
4. Explain microstates and configurations, derive Boltzmann distribution and explain its physical meaning. Explain the role of partition function.
5. Derive and statistical origins of entropy.
6. Differentiate between different ensemble theories used to explain the behavior of the systems.
7. Differentiate between classical statistics and quantum statistics.
8. Explain the statistical behavior of ideal Bose and Fermi systems.
9. Define the Fermi-Dirac and Bose-Einstein distributions; state where they are applicable; understand how they differ and show when they reduce to the Boltzmann distribution.
10. Apply the Bose-Einstein distribution to the calculation of properties of black body radiation

USPH502: Solid State Physics

1. Student will able to understand the basics of crystallography.
2. Student will able to understand the electrical properties of metals using free electron theory of solids.
3. Student will able to demarcate among the types of materials.
4. Student will able to understand the basic concepts of Fermi probability distribution function, density of states.
5. Student will able to understand in details about semiconductor physics.
6. Student will able to understand the phenomenon of superconductivity and its application.

7. Student will develop problem solving skill.

USPH503: Atomic Physics

1. to derive equations for hydrogen atom and obtain quantum numbers
2. to analyze the relationship between various types of couplings between different types of motions of electrons in an atom
3. to explain effect of magnetic field on the motions of electrons
4. to evaluate the reasons of different types of diatomic spectra
5. to understand instrumentation in spectroscopy

USPH504: Electrodynamics

1. Capable of developing concepts of electrostatics in free space and further apply them in materials.
2. Improve the understanding of the ideas such as polarization and study dielectric material medium.
3. Ability to understand Ampere's law and its use in straight wire and solenoid.
4. Evolving concepts in magnetostatics in material medium and Maxwell's equations.
5. Capability of understanding Poynting's theorem and concepts of electromagnetic waves in free space and linear medium.
6. Progress in problem solving skills in the field of electrostatics, magnetostatics, classical electrodynamics.

Applied Component: Computer Programming and System analysis

Summarize the strengths and weaknesses of Java programming and the basic concepts of object-oriented programming. Explain the use of various

keywords and program structures used in Java programming. Write Java programs using overloading, inheritance, abstract classes.

TYBSC (Semester VI)

USPH601: Classical Mechanics

1. Student will be able to understand the different aspects of classical mechanics.
2. Student will be able to understand the kinds of motions that can occur under a central potential and their applications to planetary orbits.
3. Student will be able to understand the effect of moving coordinate system.
4. Student will be able to learn the concepts needed for the important formalism of Lagrange's equations.
5. Student will be able to understand and solve simple examples using Lagrange formalism.
6. Student will be able to understand simple concepts from fluid mechanics and understanding of the dynamics of rigid bodies.
7. Student will be able to understand the drastic effect of adding nonlinear corrections to usual problems of mechanics.
8. Student will be able to understand the importance of nonlinear mechanics in understanding the irregularity we observe around us in nature.
9. Student will develop problem solving skill.

USPH602: Electronics

1. Describe construction and working of different electronic power devices including JFET, MOSFET, SCR and UJT. Explain their various industrial applications.
2. Design and analysis of differential amplifiers. Enumerate and explain the characteristics of differential amplifiers.
3. Apply op-amps fundamentals in design and analysis of op-amps applications.
4. Explain the working and design different types of multivibrators.
5. Explain the block diagram of 555 timer and design circuits using 555 timer.

6. Explain and design different Regulated DC power supply.
7. Describe the construction of logic gates based on TTL and CMOS technology.
8. Explain various digital communication technique.

USPH603: Nuclear Physics

1. to explain energetics of different decay modes of radioactivity
2. To learn about different instruments / methods used in learning different properties of radioactive radiations
3. to evaluate nuclear models (liquid drop model, shell model),
4. to explore applications of Nuclear Physics in the field of particle accelerators and energy generation,
5. to have knowledge of fundamental forces , building of nuclear matter and elementary particles.
6. To create interest in research field

USPH604: Relativity

1. To explain frame of references and classify them.
2. Understand the significance of Michelson Morley experiment and failure of the existing theories to explain the null result
3. Understand the importance of postulates of special relativity, Lorentz transformation equations and how it changed the way we look at space and time, Absolutism and relativity, Common sense versus Einstein concept of Space and time.
4. Explain stellar aberration; show how Einstein's relativity predicts its presence.
5. Construct the Minkowski's space-time diagram, using the Lorentz space time transformation.
6. Understand the momentum and energy transformation equation. Inspect the mass-energy relation.
7. Understand the transformation equations for: Space and time, velocity, frequency, mass, momentum, force, Energy, Charge and current density, electric and magnetic fields.

8. Solve problems based on Solve problems based on length contraction, time dilation, velocity addition, Doppler effect, mass energy relation and resolve paradoxes in relativity like twin paradox etc.

Applied Component: Computer Programming and System analysis

1. Explain basic principles of Python programming language
2. Interpret the fundamental Python syntax and semantics and explain Python control statements.
3. Explain use of strings and functions and use it to write Python programs.
4. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
5. Using Python library SymPy write programs to manipulate various mathematical functions.