DEPARTMENT OF PHYSICS

Overall Learning outcomes for the physics undergraduate program:

1. Students will demonstrate an understanding of core knowledge in physics, including the major premises of Mathematical Physics, Thermal Physics, Statistical Physics, Solid state Physics, Electrodynamics, Atomic and Nuclear Physics, classical mechanics and Modern Physics.
2. Students will develop written and oral communication skills in communicating physics related topics.
3. Students will design and conduct an experiments and demonstrating their understanding of the scientific method and processes.
4. Students will demonstrate proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.
5. Students will utilize a wide range of reference books, eBooks, electronic resources and information technologies for understanding of physical phenomena.
6. Students will develop skill while performing experiments and will use numerical techniques.
7. Students will demonstrate an understanding of the impact of physics and science on society.

Subject wise Learning Outcomes: On completion of this, it is expected that:

F.Y. B.Sc. (Semester I)

Classical Physics (USPH101)

1. Understand Newton's laws and apply them in calculations of the motion of simple systems.
2. Use the free body diagrams to analyse the forces on the object.
3. Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them.
4. Understand the concepts of lens system and interference.
5. Apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process.
6. Demonstrate quantitative problem-solving skills in all the topics covered

Modern Physics (USPH102)

1. Understand nuclear properties and nuclear behaviour.
2. Understand the type isotopes and their applications.
3. Demonstrate and understand the quantum mechanical concepts.
4. Demonstrate quantitative problem solving skills in all the topics covered.

Practical I (USPHP1)

1. To demonstrate their practical skills.
2. To understand and practice the skills while doing physics practical.
3. To understand the use of apparatus and their use without fear.
4. To correlate their physics theory concepts through practical.
5. Understand the concepts of errors and their estimation.

F.Y. B.Sc. (Semester II)

Mathematical Physics (USPH201)

1. Understand the basic mathematical concepts and applications of them in physical situations.
2. Demonstrate quantitative problem solving skills in all the topics covered.

Electricity and Electronics (USPH202)

1. Understand the basic theory of A.C. response of circuits and analyse different circuits consisting of basic components.
2. Understand different theorem and apply them to simplify complicated circuits which includes number of resistors and supply.
3. Students able to learn how to build power supply.
4. Understand the basics of digital electronics.

Practical II (USPHP2)

1. To understand and practice the skills while doing physics practical.
2. To understand the use of apparatus and their use without fear.
3. To correlate their physics theory concepts through practical.
4. Understand the concepts of errors and their estimation.

S.Y. B.Sc. (Semester III)

Mechanics and thermodynamics (USPH301)

1. Understand the concepts of mechanics & properties of matter & to apply them to problems.
2. Comprehend the basic concepts of thermodynamics & its applications in physical situation.
3. Learn about situations in low temperature.
4. Demonstrate tentative problem solving skills in all above areas.

Vector calculus, Analog Electronics (USPH302)

1. Understand the basic concepts of mathematical physics and their applications in physical situations.
2. Understand the basic laws of electrodynamics and be able to perform calculations using

them.

3. Understand the basics of transistor biasing, operational amplifiers, their applications.

4. Understand the basic concepts of oscillators and be able to perform calculations using them.

5. Demonstrate quantitative problem solving skill in all the topics covered.

Applied Physics - I (USPH303)

1. Students will be exposed to contextual real life situations.

2. Students will appreciate the role of Physics in 'interdisciplinary areas related to materials and Acoustics etc.

3. The learner will understand the scope of the subject in Industry & Research.

4. Experimental learning opportunities will faster creative thinking & a spirit of inquiry.

Practical course -3 (USPHP3)

1. Understand &practice the skills while performing experiments.

2. Understand the use of apparatus and their use without fear& hesitation.

3. Correlate the physics theory concepts to practical application.

4. Understand the concept of errors and their estimation.

S.Y. B.Sc. (Semester IV)

Optics and Digital Electronics (USPH401)

1. Understand the diffraction and polarization processes and applications of them in physical situations.

2. Understand the applications of interference in design and working of interferometers.

3. Understand the resolving power of different optical instruments.

4. Understand the working of digital circuits.

5. Use IC 555 time for various timing applications.

6. Demonstrate quantitative problem solving skills in all the topics covered.

Quantum Physics (USPH402)

1. Understand the postulates of quantum mechanics and to understand its importance in explaining significant phenomena in Physics.

2. Demonstrate quantitative problem solving skills in all the topics covered.

Applied Physics II (USPH403)

1. Understand the basic concepts of geology and geophysics and their applications.

2. Comprehend the basic concepts of microprocessor 8085.

3. Learn about basics of communication system, modulation and demodulation.

Practical course-4 (USPHP4)

1. Understand &practise the skills while performing experiments.
2. Understand the use of apparatus and their use without fear & hesitation.
3. Correlate their physics theory concepts to practical application.
4. Understand the concept of errors and their estimation.

T.Y. B.Sc. (Semester V)

Mathematical, Thermal and Statistical Physics (USPH501)

1. Mathematical techniques required to understand the physical phenomena at the undergraduate level and get exposure to important ideas of statistical mechanics.
2. The students are expected to be able to solve simple problems in probability, understand the concept of independent events and work with standard continuous distributions.
3. The students will have idea of the functions of complex variables; solve nonhomogeneous differential equations and partial differential equations using simple methods.
4. The units on statistical mechanics would introduce the students to the concept of microstates, Boltzmann distribution and statistical origins of entropy.
5. It is also expected that the student will understand the difference between different statistics, classical as well as quantum.

Solid State Physics (USPH502)

1. Understand the basics of crystallography, Electrical properties of metals, Band Theory of solids, demarcation among the types of materials, Semiconductor Physics and Superconductivity.
2. Understand the basic concepts of Fermi probability distribution function, Density of states, conduction in semiconductors and BCS theory of superconductivity.
3. Demonstrate quantitative problem solving skills in all the topics covered.

Atomic and Molecular Physics USPH503

1. The application of quantum mechanics in atomic physics
2. The importance of electron spin, symmetric and antisymmetric wave functions and vector atom model.
3. Effect of magnetic field on atoms and its application.
4. Learn Molecular physics and its applications.

Electrodynamics (USPH504)

1. Understand the laws of electrodynamics and be able to perform calculations using them.
2. Understand Maxwell’s electrodynamics and its relation to relativity
3. Understand how optical laws can be derived from electromagnetic principles.

4. Develop quantitative problem solving skills.

Practical Courses (USPHP05, USPHP06 and skill experiment)

1. Understanding relevant concepts.
2. Planning of the experiments.
3. Layout and adjustments of the equipment's.
4. Understanding designing of the experiments.
5. Attempts to make the experiments open ended.
6. Recording of observations and plotting of graphs.
7. Calculation of results and estimation of possible errors in the observation of result.

T.Y. B.Sc. (Semester V)

Classical Mechanics (USPH601)

1. This course will introduce the students to different aspects of classical mechanics.
2. They would understand the kinds of motions that can occur under a central potential and their applications to planetary orbits.
3. The students should also appreciate the effect of moving coordinate system, rectilinear as well as rotating.
4. The students are expected to learn the concepts needed for the important formalism of Lagrange's equations and derive the equations using D'Alembert's principle. They should also be able to solve simple examples using this formalism.
5. The introduction to simple concepts from fluid mechanics and understanding of the dynamics of rigid bodies is also expected.
6. They should appreciate the drastic effect of adding nonlinear corrections to usual problems of mechanics and nonlinear mechanics can help understand the irregularity we observe around us in nature

Electronics (USPH602)

1. Understand the basics of semiconductor devices and their applications.
2. Understand the basic concepts of operational amplifier: its prototype and applications as instrumentation amplifier, active filters, comparators and waveform generation.
3. Understand the basic concepts of timing pulse generation and regulated power supplies
4. Understand the basic electronic circuits for universal logic building blocks and basic concepts of digital communication.
5. Develop quantitative problem solving skills in all the topics covered.

Nuclear Physics (USPH603)

1. Upon successful completion of this course, the student will be able to understand the fundamental principles and concepts governing classical nuclear and particle physics and have a knowledge of their applications interactions of ionizing radiation with matter the key techniques for particle accelerators the physical processes involved in nuclear power generation.
2. Knowledge on elementary particles will help students to understand the fundamental constituents of matter and lay foundation for the understanding of unsolved questions about dark matter, antimatter and other research oriented topics.

Special Theory of Relativity (USPH604)

1. Understand the significance of Michelson Morley experiment and failure of the existing theories to explain the null result
2. 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.
3. Understand the transformation equations for: Space and time, velocity, frequency, mass, momentum, force, Energy, Charge and current density, electric and magnetic fields.
4. Solve problems based on length contraction, time dilation, velocity addition, Doppler effect, mass energy relation and resolve paradoxes in relativity like twin paradox etc.

Practical courses (USPHP07, USPHP08 and Demonstration experiments)

1. Planning of the experiments.
2. Layout and adjustments of the equipment's.
3. Understanding designing of the experiments.
4. Attempts to make the experiments open ended.
5. Recording of observations and plotting of graphs.
6. Calculation of results and estimation of possible errors in the observation of results.

HOD PHYSCICS

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