Programme Outcomes and Course Outcomes

Department of Physics
Vivekananda Satavarshiki Mahavidyalaya

1 Programme Outcomes

- **Strong foundational knowledge**: Students will develop a strong fundamental knowledge of physics, including core concepts, principles, experimental/mathematical techniques. They will also gain an understanding of the fundamental principles of mathematics/Comp. Science/ Chemistry depending on their chosen minor.
- **Problem-solving skills**: Students will develop excellent problem solving skills by applying scientific principles and mathematical techniques to analyse and solve complex problems in physics.
- **Experimental skills**: Students will acquire practical skills in designing and analysing different experiments. They will learn to use various laboratory instruments and techniques and collect and interpret experimental data, and draw meaningful conclusions. Critical thinking and analytical reasoning: Students will develop the ability to think critically, analyse information, and apply logical reasoning to evaluate the scientific phenomena and scientific results. They will also learn to assess the validity of scientific arguments, and draw evidence based conclusions.
- **Communication skills**: Students will enhance their oral and written communication skills by effectively presenting scientific phenomena and experimental results.
- **Interdisciplinary perspective**: Students will gain interdisciplinary knowledge which allowing them to explore the connection between the Physics and other scientific disciplines, for example, mathematics computer science and chemistry. It will enhance their problems solving ability.
- **Ethical and professional conduct**: Students will develop an understanding of the ethical responsibilities and professional conduct expected in scientific practice. They will be aware of the importance of integrity, safety, and ethical considerations in their work.

2 Programme Specific Outcomes

Course Outcomes of CC, SEC & DSE Courses of Physics Honours.

2.1 Semester-I

PAPER	COURSE	OUTCOMES
C1	C1T: Mathematical methods – I (Theory)	The students will gain knowledge about vector algebra and about the solution of differential equations and its application in the physical world. Also they shall learn about the different co-ordinate frames together with the concept of probability and various sources of error and how to calculate them.
C2	C2T: Mechanics (Theory)	Understand laws of motion, reference frames, and its applications. At the end of the prescribed syllabus, the students will acquire basic knowledge of mechanics, gravitation and will understand how to apply the conservation of rotational motion in different parts of physics. The concept of central force system and application of variational principle to solve different problems in mechanics will be learnt. Develop understanding of special theory of relativity and its applications to understand length contraction, time dilation, relativistic addition of velocities, conservation of momentum and variation of mass, relativistic momentum, relativistic energy, and mass-energy relation.
GE1	GE1T: Elements of Modern Physics (Theory)	The students will gain knowledge about — Planck's quantum, problems with Rutherford model, Bohr's quantization rule, position measurement, two slit interference experiment, one dimensional infinitely rigid box, size and structure of atomic nucleus and its relation with atomic weight, Radioactivity and Nuclear reactor.

2.2 SEMESTER-II

PAPER	COURSE	OUTCOMES
C3	C3T: Electricity and Magnetism (Theory)	After successful completion of this course, students will be able to understand electric and magnetic fields in matter, dielectric properties of matter, magnetic properties of matter, electromagnetic induction, and applications of Kirchofff's law in different circuits, applications of network theorem in circuits
C4	C4T: Waves and Optics (Theory)	Students will be able to understand superposition of harmonic oscillations, different types of wave motions, superposition of harmonic waves, interference and interferometer, diffraction, holography.

GE2	GE2 T - Thermal Physics and Statistical Mechanics (Theory)	At the end of the prescribed syllabus, the students will learn about — laws of thermodynamics, thermodynamic description of system, thermodynamical potentials, transport phenomena (Viscosity, Conduction and Diffusion),lLaw of equipartition of energy, theory of Radiation and concepts of phase space, Entropy, thermodynamic probability and Quantum statistics.

2.3 SEMESTER-III

PAPER	COURSE	OUTCOMES
C5	C5T: Mathematical Physics-II (Theory)	Will gain knowledge about solution of second order differential equation and also about Fourier series and also special functions and integrals
C6	C6T: Thermal Physics (Theory)	Understand the process of thermal conductivity, viscosity and diffusion in gases, and also the concept of Brownian Motion and its Significance. Understand the efficiency of Carnot's engine and the significance of first law and second law of thermodynamics and implications of second law of thermodynamics and limitations placed by the second law on the performance of thermodynamic systems. Ability to evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculation. Will learn about Maxwell's Thermodynamic Relations. Understand the interrelationship between thermodynamic functions and ability to use such relationships to solve practical problems
C7	C7T: Digital Systems and Applications (Theory	Will gain knowledge about Boolean algebra, integrated circuits, digital circuits and basic idea of Multiplexers, De-multiplexers, Decoders, Encoders, Timers etc
SEC-1	SEC-1:Physics Workshop Skill	Students will learn about — Measuring units (conversion to SI and CGS, Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.), Concept of workshop practice, Concept of machine processing, Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope and working principle of power generation systems.

2.4 SEMESTER-IV

PAPER	COURSE	OUTCOMES
C8	C8T: Mathematical Physics III (Theory)	Will acquire the concept of complex algebra, Integrals Transforms and Matrices; and their applications in the physical world.
C9	C9T: Elements of Modern Physics (Theory)	The students will learn about — Photo-electric effect, Compton scattering, De Broglie wavelength, matter waves, Wave-particle duality, Heisenberg uncertainty principle, Davisson-Germer experiment. Group, Phase velocities and relation between them. Will also learn and gain knowledge about Liquid Drop model and applications of Laser.
C10	C10T: Analog Systems and Applications (Theory)	The students will gain knowledge about — Semiconductor diodes, Rectifier diodes, Transistors, Amplifiers and their applications
SEC-2	SEC-2T: Basic Instrumentation Skills (Theory)	Will learn about — Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects . Principle and working of digital meters/digital multimeter/digital bridges. Applications of Electronic Voltmeter, CRO and Signal Generators etc.
GE4	GE4T: Digital, Analog Circuits and Instrumentation (Theory)	Will learn how to convert Decimal to Binary and Binary to Decimal . Use of AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. Simplification of Logic Circuit using Boolean Algebra. The students will gain knowledge about — Principle and structure of (1) LEDs, (2) Photodiode, (3) Solar Cell. Applications of Op-Amps: (1) Inverting and non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero crossing detector

2.5 SEMESTER-V

PAPER	COURSE	OUTCOMES
C11	C-11T: Quantum Mechanics and Applications (Theory)	Will understand the differences between classical and quantum mechanics. Will understand the Schrodinger wave mechanics and operator formalism. Will motivate the students to apply Schrodinger equation or solving problems in Wave mechanics. Appreciate the importance and develop an understanding of angular momentum.
C12	C-12T: Solid State Physics (Theory)	The students will get to know about the structure of a solid, the concept of the magnetic properties of matter, the elementary band theory and also the superconductivity

DSE1	DSE-1: Classical Dynamics	The students will get to know about the classical mechanics of point particles and the fluid dynamics. The students will also gain negation of ether concept and also about the geometry of space-time and space-time interval.
DSE2	DSE-2: Nuclear and Particle Physics	To acquire knowledge and apply it to study the structure of nucleus. Know the formation of nucleus and their binding energy. To motivate the students and analyze the energy released by the nucleus during the fission and fusion process. The students will also learn about particle interactions, concept of quark model and particle accelerators

2.6 SEMESTER-VI

PAPER	COURSE	OUTCOMES
C13	C13T: Electromagnetic Theory (Theory)	Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse problems. Ability to formulate potential problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media and also solve such problems using the method of images. Ability to define and derive expressions for the energy both for the electrostatics and magnetostatics fields, and derive Poyntings theorem from Maxwell's equations and physical interpret. Thorough knowledge of electromagnetic nature of wave will be gained together with the proof of basic laws of reflection and refraction. Knowledge about wave guides and optical fibres and their application will be acquired by the students
C14	C14T: Statistical Mechanics (Theory)	Will gain the knowledge of statistical system and its co-ordinate together with application of MB, FD and BE statistics. In addition to this, the students will get to know about the classical and quantum theory of radiation.
DSE3	DSE-3: Communication Electronics	The students will gain knowledge about the basic concept of mobile communication, satellite communication and Navigation systems.
DSE4	DSE-4: Digital Signal Processing	Will gain the knowledge of Digital Filters, Discrete Fourier Transform and Fast Fourier Transform etc.

Note: More over there are practical papers [C1P, C2P, C3P, C4P, C5P, C6P, C7P, C8P, C9P, C10P, C-11P, C-12P, C-13P,C14P, SEC, DSE, GE1P, GE2P, GE4P etc.] in which the students are allowed to testify and visualise the different phenomenon of physics so that the students are motivated towards the subject. There is also computational lab where students not only learn computer programming and numerical analysis but their application in solving problems in physics.