Semester	Paper	Course	Course Outcome (CO)
1st	**PHS-G-CC-1-1-TH Mechanics (Theory)**	**1. Mathematical Methods (15 Lectures)** (a) Vector Algebra: Addition of vectors and multiplication by a scalar. Scalar and vector products of two vectors, vector triple product. Representation of vectors in terms of basis vectors. (b) Vector Analysis: Derivatives of a vector with respect to a parameter. Gradient, divergence and Curl. Vector integration, line, surface and volume integrals of vector fields. Gauss divergence theorem and Stoke's theorem of vectors (Statement only) and their significances. (c) Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous and inhomogeneous differential equations with constant coefficients.	Students will learn vector algebra, scaler and vector products, vectors identities, and vector calculus, with applications in all areas of physics. Students will learn to solve first and second-order homogeneous and inhomogeneous differential equations with constant coefficients, with application in damped Harmonic oscillators and other areas of physics.
		2. Introduction to Newtonian Mechanics (5 Lectures) (a) Laws of Motion: Idea of space time for Newtonian Mechanics, frames of reference, Newton's Laws of motion. Dynamics of a system of particles. Conservation of momentum. Centre of Mass. (b) Work-energy theorem. Conservative forces. Concept of Potential Energy. Conservation of energy.	At the end of the discussion, students will be able to understand the meaning of Newton's laws and their applicability in diverse physical phenomena. Also, they will understand the dynamics of system of particles in realistic scenarios. Moreover, they will have a clear understanding on the conservation laws.
		3. Rotational Motion (10 Lectures) Rotation of a rigid body about a fixed axis. Angular velocity and angular momentum. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Torque. Conservation of angular momentum.	At the end of this discussion, students will be able to understand the basic properties of rigid body and how to calculate moment of inertia for some simple geometries.
		4. Central force and Gravitation (10 Lectures) Motion of a particle in a central force field. Conservation of angular momentum leading to restriction of the motion to a plane and constancy of areal velocity. Kepler's Laws (statement only). Newton's Law of Gravitation. Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS).	At the end of this course, students will learn central force field, law of force in central force field, Kepler's Laws, Newton's Law of Gravitation, and Satellite in circular orbit and its applications.
		5. Oscillations (9 Lectures) Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Forced oscillations with harmonic forces.	Students will learn Simple harmonic motion. Differential equation of SHM and its solutions
		6. Elasticity (6 Lectures) (a) Hooke's law, elastic moduli, relation between elastic constants, Poisson's Ratio, Expression for Poisson's ratio in terms of elastic constants. (b) Twisting couple on a cylinder. Determination of Rigidity modulus by static torsion. Torsional pendulum. (c) Bending of beams, Cantilever. Work done in stretching and work done in twisting a wire.	At the end of the discussion, students will be able to understand general properties of matter related to elasticity. The students will learn Hooke's law, Poisson's Ratio, Rigidity modulus and Cantilever with realistic examples and applications.

		7. Surface Tension (5 Lectures) Molecular theory of surface tension, surface energy, comparison between surface tension and surface energy, variation of surface tension with temperature, application to spherical drops and bubbles Synclastic and anticlastic surface, excess of pressure, capillary rise of liquid.	Students will be able to learn the theory of surface tension and applications of it various physics problems.
	PHS-G-CC-1-1-P **Mechanics (Practical)**	**List of Practical** 1. Determination of Moment of inertia of cylinder/bar about axis by measuring the time-period, of the cradle and with body of known moment of Inertia. 2. Determination of Y modulus of a metal bar of rectangular cross section by the method of flexure. 3. Determination of rigidity modulus of wire by measuring the time-period of torsional oscillation of a metal cylinder attached to it. 4. Determination of Moment of Inertia of a flywheel. 5. Determination gravitational acceleration, g using bar pendulum.	At the end of these experiments students will develop skill to study various mechanical properties and their inter connections experimentally.
2nd	**PHS-G-CC-2-2-TH** **Electricity and Magnetism (Theory)**	**1. Essential Vector Analysis (5 Lectures)** (a) Vector Algebra: Addition of vectors and multiplication by a scalar. Scalar and vector products of two vectors. (b) Vector Analysis: Gradient, divergence and Curl. Vector integration, line, surface and volume integrals of vector fields. Gauss' divergence theorem and Stoke's theorem of vectors (Statement only) and their significances.	Students revisit Vector algebra and vector calculus taught in 1st semester. They learn divergence and Stokes theorem and their application in electrostatics.
		2. Electrostatics (25 Lectures) (a) Coulombs law, principle of superposition, electrostatic field. Electric field and charge density, surface and volume charge density, charge density on the surface of a conductor. Force per unit area on the surface. (b) Electric dipole moment, electric potential and field due to an electric dipole, force and Torque on a dipole. Electric Fields inside matter, Electric Polarisation, bound charges, displacement density vector, linear Dielectric medium, electric Susceptibility and Permittivity. (c) Divergence of the Electrostatic field, flux, Gauss's theorem of electrostatics, applications of Gauss theorem to find Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Gauss's theorem in dielectrics. (d) Curl of the Electrostatic Field. Conservative nature of electrostatic field, Introduction to electrostatic potential, Calculation of potential for linear, surface and volume charge distributions, potential for a uniformly charged spherical shell and solid sphere.	Students will learn Coulomb's law in detail with electric field, potential and Gauss's law for different charged surfaces. They learn properties of conductors and its applications. They learn dielectrics and their behaviour and applications.

		Calculation of electric field from potential. Energy per unit volume in electrostatic field.	
		3. Magnetism (15 Lectures) (a) Introduction of magnetostatics through Biot-Savart's law. Application of Biot-Savart's law to determine the magnetic field of a straight conductor, circular coil, solenoid carrying current. Force between two straight current carrying wires. Lorentz force law. (b) Divergence of the magnetic field, Magnetic vector potential. (c) Curl of the magnetic field. Ampere's circuital law. Determination of the magnetic field of a straight current carrying wire. Potential and field due to a magnetic dipole. Magnetic dipole moment. Force and torque on a magnetic dipole. (d) Magnetic fields inside matter, magnetization, Bound currents. The magnetic intensity H. Linear media. Magnetic susceptibility and Permeability. Brief introduction of dia, para and ferro-magnetic materials.	Students will learn Biot-Savart law and its application for different problems to find magnetic fields. They learn different properties of magnetic materials like dia para and ferro magnetic materials.
		4. Electromagnetic Induction (5 Lectures) Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils.	Students will learn Faraday's laws of electromagnetic induction and their applications.
		5. Electrodynamics (10 Lectures) Maxwell's Equations, Equation of continuity of current, Displacement current, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, Poynting vector, decay of charge in conducting medium.	Students will learn Maxwell's equations and electromagnetic wave and its propagation through space.
	PHS-G-CC-2-2-P **Electricity and Magnetism (Practical)**	**List of Practical** 1. Determination of unknown resistance by Carey Foster method. 2. Measurement of a current flowing through a register using potentiometer. 3. Determination of the horizontal components of earth's magnetic field. 4. Conversion of an ammeter to a voltmeter. 5. Conversion of a voltmeter to an Ammeter.	At the end of these experiments, students will develop skill to study various electrical and magnetic properties of different instruments.
3rd	**PHS-G-CC-3-3-TH** **Thermal Physics and Statistical Mechanics (Theory)**	**1. Laws of Thermodynamics (18 Lectures)** (a) Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P and C_V, Work Done during Isothermal and Adiabatic Processes. Compressibility and Expansion coefficients, Reversible and irreversible processes. (b) Second law and Entropy, Carnot's cycle & Carnot's theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams. (c) Third law of thermodynamics, unattainability of absolute zero.	The course makes the students able to understand the basic physics of heat and temperature and their relationship with energy, and work. The students also learn how different laws of thermodynamics are used. Importantly, students will learn the second law of thermodynamics and its application to various processes.

		2. Thermodynamical Potentials (9 Lectures) Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications: Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for (C_P and C_V). TdS equations.	At the end of this discussion students will be able to get an idea of thermodynamic potentials and their use in different physical processes.
		3. Kinetic Theory of Gases (10 Lectures) Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.	At the end of this topic, students will learn about Maxwell's law of distribution of velocities, mean free path, transport phenomena and learn to solve various problems.
		4. Theory of Radiation (8 Lectures) Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.	At the end, students will learn Blackbody radiation, Spectral distribution and Planck law, Wien displacement law and their applications.
		5. Statistical Mechanics (15 Lectures) Phase space, Macrostate and Microstate. Ensemble, Ergodic hypothesis. Entropy and Thermodynamic probability, Boltzmann hypothesis. Maxwell-Boltzmann law of distribution of velocity. Quantum statistics (qualitative discussion only). Fermi-Dirac distribution law (statement only), electron gas as an example of Fermi gas. Bose-Einstein distribution law (statement only), photon gas as an example of Bose gas. Comparison of three statistics.	At the end of this discussion, students will learn the basics: Phase space, Macrostate and Microstate. Ensemble, Ergodic hypothesis. Entropy and Thermodynamic probability, etc. Students will develop idea of studying macroscopic systems, learn properties of bosons and application of BE stat, etc.
	PHS-G-CC-3-3-P **Thermal Physics and Statistical Mechanics (Practical)**	**List of Practicals** 1. Determination of the coefficient of thermal expansion of a metallic rod using an optical lever. 2. Verification of Stefan's law of radiation by the measurement of voltage and current of a torch bulb glowing it beyond draper point. 3. To determine Thermal coefficient of Resistance using Carey forster bridge. 4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method. 5. 5. Determination of the pressure coefficient of air using Jolly's apparatus.	At the end of these experiments, students will develop sufficient skill to perform experiments related to different thermal properties of matter.

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<td>PHS-A SEC-B-TH
Scientific Writing (Theory+Project)</td>
<td>
1. Introduction to LATEX (2 Lectures)
The difference between WYSIWYG and WYSIWYM. Preparing a basic LATEX file. Compiling LATEX file.
2. Document classes: (1 Lectures)
Different type of document classes, e.g., article, report, book etc.
3. Page Layout (2 Lectures)
Titles, Abstract, Chapters, Sections, subsections, paragraph, verbatim, References, Equation references, citation.
4. List structures: (1 Lectures)
Itemize, enumerate, description etc.
5. Representation of mathematical equations (5 Lectures)
Inline math, Equations, Fractions, Matrices, trigonometric, logarithmic, exponential functions, line-surface-volume integrals with and without limits, closed line integral, surface integrals, Scaling of Parentheses, brackets etc.
6. Customization of fonts (1 Lectures)
Bold fonts, emphasise, mathbf, mathcal etc. Changing sizes Large, Larger, Huge, tiny etc.
7. Writing tables (2 Lectures)
Creating tables with different alignments, placement of horizontal, vertical lines.
8. Figures (1 Lectures)
Changing and placing the figures, alignments

Packages: amsmath, amssymb, graphics, graphicx, Geometry, algorithms, color, Hyperref etc. Use of Different LATEX commands and environments, Changing the type style, symbols from other languages. special characters.

List of some sample Projects
1. Writing articles/ research papers/reports
2. Writing mathematical derivation
3. Writing Resume
4. Writing any documentation of a practical done in laboratory with results, tables, graphs.
5. Writing graphical analysis taking graphs from outside.
</td>
<td>At the end of this lesson, students will develop Technical Skill of handling scientific writing with LATEX. Specifically, they will get an introductory overview of LATEX, and will be able to write short paragraphs using Latex command, command for mathematical equations, the font sizes and related details, tables with different structures, figures in the latex file, and many more. Finally, they will be able to write long scientific documents under the project art of this topic.</td>
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<tr>
<td rowspan="2">4th</td>
<td rowspan="2">PHS-G-CC-4-4-TH

Waves and Optics (Theory)</td>
<td>1. Accoustics (10 Lectures)
Review of SHM, damped & forced vibrations: amplitude and velocity resonance. Fourier's Theorem and its application for some waveforms e.g., Saw tooth wave, triangular wave, square wave. Intensity and loudness of sound. Intensity levels, Decibels.</td>
<td>Students will be able to learn the fundamentals of simple harmonic motion and their properties.</td>
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<td>2. Superposition of vibrations (5 Lectures)
(a) Superposition of Two Collinear Harmonic oscillations having equal frequencies and different frequencies (Beats).
(b) Superposition of Two Perpendicular Harmonic Oscillation for phase difference $\delta = 0, \pi/2, \pi$: Graphical and Analytical Methods, Lissajous Figures with equal and unequal frequency and their uses.</td>
<td>Students will be able to apply superposition via graphical and analytical methods.</td>
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		3. Vibrations in String (8 Lectures) Wave equation in stretched string and its solutions. Boundary conditions for plucked and struck strings. Expression of amplitude for both the cases (no derivation), Young's law, Ideal of harmonics. Musical scales and notes.	At the end of this topic the students will be able to learn the dynamical features of vibrating strings.
		4. Introduction to wave Optics (2 Lectures) Definition and Properties of wave front. Huygens Principle, Electromagnetic nature of light.	Students will learn about the electromagnetic nature of light.
		5. Interference (15 Lectures) Superposition of two waves with phase difference, distribution of energy, formation of fringes, visibility of fringes. Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stoke's treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer (a) Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index.	At the end of this topic the students will be able to learn the Interference phenomenon and its various applications.
		6. Diffraction (10 Lectures) (a) Fraunhofer diffraction Single slit; Double Slit. Multiple slits and Diffraction grating. (b) Fresnel Diffraction: Half-period zones. Zone plate.	At the end of this topic, students will be able to learn the basics of Fraunhofer and Fresnel diffraction and its application.
		7. Polarization (10 Lectures) Transverse nature of light waves. Plane polarized light, production and analysis. Circular and elliptical polarization. Optical activity.	
	PHS-G-CC-4-4-P **Waves and Optics (Practical)**	**List of Practicals** 1. Determination of the focal length of a concave lens by auxiliary lens method. 2. Determination of the frequency of a tuning fork with the help of sonometer. 3. Determination of radius of curvature of plano convex lens/wavelength of a monochromatic or quasi monochromatic light using Newtons ring. 4. Measurement of thickness of a paper from a wedge-shaped film. 5. Measurement of specific rotation of active solution (e.g., sugar solution) using polarimeter.	At the end of these experiments, students will develop skill to study various optical properties experimentally. Also, they will study the longitudinal waves (sound waves) experiment using sonometer.
	PHS-A SEC-B - TH **Electrical Circuits and Network skills (Theory)**	**1. DC generator: (10 Lectures)** (a) EMF generated in the armature for simplex lap and wave winding, concept of pole, Methods of Excitation, Armature reaction, Dc motor: Torque equation of D.C motor, speed& torque Operating Characteristics of separately excited, Shunt, Series &Compound motors with emphasis on application areas. (b) Three phase generator, concept of stator and rotor, star and delta connections – their current voltage relationships (both line and phase current & voltage).	At the end of this Skill-based course, student will be able to learn the followings: 1. Understanding of DC generators and motors, including their operating characteristics and applications. 2. behaviour of transformers under different load conditions and connection configurations.

		2. Transformer: (5 Lectures) Types of transformers, basic emf equation, no load current, leakage inductance, Magnetising current and equivalent circuit of single phase transformer on no-load and on load, idea of star/star, star/delta, delta/star, and zig-zag connection of 3 phase transformer, 3 phase to 2 phase transformation, Scott T connection. **3. AC motor (6 Lectures)** (a) Single phase AC motor – double field revolving theory, slip-speed characteristics, (b) Construction of 3 phase induction motor and its action using rotating field theory, equivalent circuit of induction motor, Speed control by V/f control of induction motor (block diagram only). **4. Measurements and faults (9 Lectures)** (a) Measurement of three phase power by two and three wattmeter method, theory of induction type wattmeter and its use as energy meter in domestic house. Megger. (b) Unsymmetrical faults in distribution system, Common switchgear equipments like relay, circuit breakers and fuses, Simple oil circuit breaker and SF6 circuit breaker, Construction of protective relay in distribution bus-bar system, Block diagram of a utility distribution sub-station.	3. characteristics of both single-phase and 3-phase AC motors. 4. measurements related to three-phase power and use of instruments such as wattmeters and meggers. Also, analyze common faults in electrical distribution systems and understand the function of protective devices and switchgear equipment.
5th	**DSE A (2)** **PHS-G-DSE-A-TH** **Modern Physics (Theory)**	**1. Radiation and its nature (22 Lectures)** (a) Blackbody Radiation, Planck's quantum hypothesis, Planck's constant (derivation of Planck formula is not required). Photoelectric effect and Compton scattering - light as a collection of photons. Davisson-Germer experiment. De Broglie wavelength and matter waves. Wave-particle duality. Wave description of particles by wave packets. Group and Phase velocities and relation between them. Probability interpretation: Normalized wave functions as probability amplitudes. (b) Two-slit experiment with photons and electrons. Linear superposition principle as a consequence. (c) Position measurement, gamma ray microscope thought experiment. Heisenberg uncertainty principle (Statement with illustrations). Impossibility of a particle following a trajectory.	At the end of this lesson, students will be able to understand the basics of black body radiation and connection between wavelike and particle like characters of photons and other material particles. Also, students will get basic ideas of Quantum mechanics as well as idea of uncertainty principle through various thought examples.
		2. Foundation of Quantum Mechanics (28 Lectures) (a) Schrödinger equation as a first principle. Probabilistic interpretation of wavefunction and equation of continuity (in 1D). Time evolution of wavefunction and $\exp(iHt/\hbar)$ as the evolution operator. Stationary states. Eigenvalue equation.	At the end of this topic, students will be able to understand the Schrödinger equation and fundamental postulates of Quantum Mechanics, interpretation of wave-function and equation of continuity, concept of simultaneous Measurement and associated problems, linear Hermitian operators, expectation values in measurements,

		(b) Postulates of Quantum Mechanics: States as normalized wavefunctions. Dynamical variables as linear Hermitian operators (position, momentum, angular momentum, and energy as examples). Expectation values of operators and their time evolution. Ehrenfest theorem. (c) Application to one dimensional systems, Boundary conditions on wave functions. • Particle in an infinitely rigid box (x = 0 to x = a), energy states, wave function and its normalisation. • Particle in front of a step potential, reflection coefficient.	and application of Schrödinger equation to solve one-dimensional systems.
		3. Special Theory of Relativity (15 Classes) (a) Michelson-Morley experiment. Lorentz transformation. Time dilation and length contraction. Velocity addition rule. (b) Relativistic dynamics. Elastic collision between two particles. Idea of relativistic momentum and relativistic mass. Mass-energy equivalence.	At the end of this important lesson, students will have clear basic idea about Einstein's special theory of relativity. Specifically, time dilation, length contraction, velocity addition rule, rest mass and relativistic mass, and mass-energy equivalence.
		4. Lasers (10 Lectures) Einstein's A and B coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Ruby Laser and He- Ne Laser. Basic lasing action.	At the end of this topic, students will be able to understand working principle of a LASER. They will also acquire knowledge about different two, three and four level systems for lasing operation.
6th	**DSE B (2)** **PHS-G-DSE-B-TH** **Nuclear & Particle Physics (Theory)**	**1. General Properties of Nuclei (10 Lectures)** (a) Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot.	At the end of this lesson, student will learn about the size and other structural properties of atomic nucleus and its relationship with atomic mass number, semi-empirical mass formula and binding energy.
		2. Nuclear Models (10 Lectures) (a) Liquid drop model approach, semi empirical mass formula and significance of its various terms, condition of nuclear stability, two nucleon separation energies. (b) Evidence for nuclear shell structure - nuclear magic numbers. Basic assumptions of shell model, concept of nuclear force.	At the end of this topic, students will understand nuclear models (liquid drop model and shell model) and their implications for nuclear stability and shell structures.
		3. Radioactivity (12 Lectures) (a) α decay: basics of α decay processes. Theory of α emission, Geiger Nuttall law, α decay spectroscopy. (b) β decay: energy and kinematics of β decay, positron emission, electron capture, neutrino hypothesis. (c) γ decay: Gamma ray emission & kinematics, internal conversion.	At the end of the discussion, students will learn about Radioactivity, which covers the following topics: stability of nucleus, radioactive decay law, mean and half-lives, α-decay, β-decay, energy released, spectrum and Pauli's prediction of neutrino, and γ-ray emission.
		4. Nuclear Reactions (7 Lectures) Types of Reactions, Conservation Laws, kinematics of reactions, Q value, reaction rate, reaction cross section, Concept of compound and direct Reaction, resonance reaction.	At the end of this lesson, student will get ideas about nuclear reactions, including their kinematics, energetics, and different types of reactions.

		5. Detector for Nuclear Radiations (15 Lectures) Gas detectors: estimation of electric eld, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si and Ge) for charge particle and photon detection (concept of charge carrier and mobility), neutron detector.	At the end, students will get an idea about the principles and operation of detectors used for nuclear radiation detection.
		6. Particle Accelerators (15 Lectures) Accelerator facility available in India, Different type of accelerators • Van-de Graaf generator (Tandem accelerator) • Linear accelerator • Cyclotron • Betatron • Synchrotrons	Students will get information about the principles and functions of various types of particle accelerators. Additionally, they will get to know about the currently available accelerator facilities in India
		7. Particle Physics (6 Lectures) Fundamental particles and their families. Fundamental particle interactions and their basic features. Symmetries and Conservation Laws, Baryon number, Lepton number, Isospin, Strangeness and Charm. Quark model, Quark structure of hadrons.	At the end of this course, students will be able to learn the domain of fundamental particles and their interactions in nature. Students will learn different class of fundamental particles and their interactions as well as conservation laws. They will learn about the quark model.

Program Outcomes (PO)

The theoretical and experimental topics covered in the course outcome (CO) document, aim to equip students with skills, knowledge, mathematical proficiency, and critical thinking. It focuses on the application of theoretical and experimental knowledges across interdisciplinary and diverse fields, preparing students to excel in academia, industry, and other real-life arenas.

The experimental lab helps students to develop skills and competencies for future experimental research and development (R&D), as well as to tackle real-world challenges.

GNUPLOT, Python programming, and LaTeX have profound impacts on students aiming to pursue careers in academia, industry, research, engineering, and self-employment. These skills (with open-source scientific software) are essential for data visualization and analysis in the highly demanding field of data science, scripting, critical data analysis, and algorithm development. Python programming enhances software development capabilities, while LaTeX equips students with scientific document preparation skills, mathematical typesetting, and collaborative writing abilities. Together, these tools empower students to excel in various technical and scientific domains.