Programme Outcomes - UG

The Undergraduate programme is spread over six semesters and offers twenty-six courses,focusingon the academic growth of students.

Arts/ Science/ Commerce

The Undergraduate Arts / Science/ Commerceprogrammes are aimed at providing students an in-depth studyto comprehendconcepts and theories,andto equip them with basic knowledge for their progression into higher education and/or greater employability.The objective is to enable them to:

- *Demonstrate comprehensive knowledge and understanding of one or more disciplines.*
- *Develop inter-disciplinary analytical skills and critical thinking.*
- *Develop Language Proficiency and Communication Skills*
- *Express thoughts and ideas effectively both in oral and written form*
- *Analyze, synthesize and integrate knowledge.*
- *Become employable in government and non government organizations.*
- *Seek employment in high-level positions in a company, as well as have the competency to pursue higher education*
- *Understand the factors that propel change in society*
- *Be actively involved in social and professional services at the local, national and global levels.*
- *To introduce the discipline to students from diverse backgrounds/ trainings and capabilities.*
- *To initiate the students into open-mindedand progressive ways of thinking.*
- *To provide a foundation for other more detailed and specialized courses in the chosen discipline*

PSO/CO for UG courses in Science, Arts and Commerce

B.Sc. BOTANY HONOURS

Programme Objective:

The most important objective of the programme B.Sc. Botany honours is to understand the scope and significance of the discipline. To develop interest and curiousity towards plants and other life forms. This aims to develop ability in students about the branches and interaction of the plants with microorganisms and other components of environment. The objective is also to equip the students with the knowledge of evolution, development and importance of plants for human kind, with the application of current robust technologies for deciphering the hidden facts and figures related to the plants.

Programme Specific Objective:

The objective of the course is to develop skills in students to be able to identify and name the plants. They could gain and use the knowledge in the current scenario of development in science and technology to get better critical thinking: to include creative thinking, innovation, inquiry and analysis, evaluation of information. This will enable the students to develop scientific temperament after completion of the program. This will equip the students to do laboratory work from different equipments and they will be able to excel in the field related to scientific research in the area of Botany

Course Objective:

Core Course

CC101- To gain knowledge about the microbial world and the different class and examples of microorganisms‘ like- bacteria, viruses and algae. Their general characters, ecology, occurrence, classification and morphology. Various applications and uses in agriculture, environment, biotechnology and industries.

CC102- To learn that biomolecules like carbohydrates, proteins, nucleic acids and lipids are fundamental building blocks of living organisms. Their biosynthesis, properties and functions in an organism. The cell structure and subcellular components. Structural and chemical composition of the cell.

CC203- To gain knowledge about general characteristics (asexual and sexual fruiting bodies), life cycle of the fungi and their different class. Their ecology, occurrence, classification and morphology. Different related diseases and pathogenic fungi, control measures and Host- Pathogen relationships.

CC204- To learn about unifying features of archegoniates- the primitive plants and their transition to land habit. The study of bryophytes, pteridophytes and gymnosperms; general characteristics, classification, early land plants; classification (up to family), morphology, anatomy and reproduction in these organisms.

CC305- To gain knowledge about identification, classification, nomenclature; biosystematics, taxonomic hierarchy and systems of classification. To learn about families of angiosperms; floral and general characters. Parts of trees and phylogeny of angiosperms; the primitive and advanced terms and concepts of evolution.

CC306- To learn about different economically important classes of herb, shrubs and trees. Originof cultivated plants. The plant that are major cereal, legume, sugar, spices, and timber producers. The different parts of plants like oil seeds and their importance. The process of harvesting the products and economic uses.

CC307- To get acquainted with the basics of genetics and chromosomal inheritance. The unit of heredity; classical and modern concepts of genetics. Interactions and deviations from mendelism. The abnormalities, variations, molecular basis of mutations and their types.

CC408- To gain knowledge about macromolecules and the mechanisms of gene replication, mutation and expression. Also understanding how various cellular systems interact in terms of the way DNA, RNA and protein synthesis function. The different levels of regulation and maintenance of information in a cell.

CC409- To learn about distribution and abundance of plants, the effects of environmental factors upon their abundance, and the interactions among and between plants and other organisms. Abiotic components of earth‘s environment like air, soil, water, temperature and fire etc. Ecosystems, ecotones and their interactions, energy production and energy flow among.

CC410- To get acquainted with plant anatomy of angiosperms. Plant Anatomy Applications in systematics, forensics and pharmacognosy. Study of tissue and cellular level of organization of stem, root and leaf in dicots and monocots. The adaptive and protective mechanisms and secretory systems in plants.

CC511- To gain knowledge about reproduction in angiosperms, organization and ultra-structure of the reproductive cells. Pollination and its types. Fertilization and formation of zygote and study of embryogenesis, its developmental stages. Seed structure, importance and dispersal mechanisms.

CC512- To learn about functioning and physiology of plants. Fundamental processes such as plant nutrition and essential nutrients, plant hormones and functions. Plant water

relations, nutrient uptake, physiology of flowering.

CC613- To gain knowledge about concept of metabolism, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes Mechanisms of signal transduction, nitrogen metabolism, lipid metabolism and ATP-Synthesis.

CC614- To get acquainted with the knowledge of genetic engineering, the manipulation of microorganisms, plants and animals at gene level to alter the character according to our need. The different modifying enzymes and catalysts for genetic engineering.. Plant tissue culture methods and applications of plant biotechnology.

Skill Enhancement Course

SEC I- To enhance the skills related to mushroom cultivation technology by hands-on experience in different research institutions /organization carrying out such production processes. Students learn the history of the cultivation techniques. Nutritional and medicinal value of edible mushrooms and Poisonous mushrooms. Cultivation, storage and nutritional properties of mushrooms.

SEC II- To enhance the skills in ethnobotany by visiting the traditional groups and tribal people of the local area and learn relevance of ethnobotany in the present context and ethnic groups of tribals and their lifestyle. To get well acquainted with the legal aspects, intellectual property rights and ethnobotany as an interdisciplinary science.

Discipline Elective Course

DSE I- To acquaint the students about different ecotourism, urban gardening, and various techniques of plant propagation. Floriculture, landscaping and garden designing. Preservation of post harvest crop plants, study of various diseases of fruits, vegetables and crop plants. Students visit to suitable locations to explore gardens, nurseries and horticultural fields.

DSE II- To acquaint the students with different techniques applied for cellular and molecular analysis of bio-molecules, cells and cellular components. The imaging of cells and tissue; separation and characterization of biomolecules like proteins, RNA and DNA through molecular techniques like electrophoresis. The statistical methods applied for data processing and analysis of biological data.

DSE III- To enable the students learn about the objectives of plant breeding, different methods of crop improvement to develop superior varieties. Quantitative inheritance in plants; concept, mechanism, examples. Crop improvement and breeding, role of mutations; polyploidy; distant hybridization and role of biotechnology in crop improvement.

DSE IV- To gain knowledge about basic concepts of research, general laboratory practices; data collection and methods of documentation of observations. Learn the basics of maintaining a laboratory record. Different methods to study plant cell/tissue structure. To learn the art of scientific writing and its presentation.

MATHEMATICS HONOURS

TITLE OF THE PAPER	Analytic Geometry 2D, Higher Algebra & Trigonometry
PAPER CODE	CC-1
CREDITS	6

On successful completion of this paper students will learn to:

(i) The concept of two dimensional plane and different rules of ellipse, parabola and hyperbola.

(ii) The primary objective of this course is to introduce the basic tools of geometric properties of different conic sections which are helpful in understanding their applications.

(iii) The basic trigonometric functions and their applications.

TITLE OF THE PAPER	Differential Calculus & Vector Calculus
PAPER CODE	UCCMATH 102 (A)
CREDITS	4

On successful completion of this paper students will learn to:

(i) The primary objective of this course is to introduce the basic knowledge of Partial differential equations, Curvature, Asymptotes, Maxima and Minima of two variables etc.

(ii) Also know the applications in real life problems.

(iii) Vector Calculus and its applications in different disciplines.

TITLE OF THE PAPER	Differential Calculus & Vector Calculus
PAPER CODE	xxxx
CREDITS	2

On successful completion of this paper students will learn to:

(i) This course aims at familiarizing students with MATLAB.

(ii) For plotting functions, animations and various applications of matrices.

(iii) Also, to carry out the sessions in computer lab to have a deep conceptual understanding to widen the horizon of students‘ self-experience.

TITLE OF THE PAPER	Differential Calculus & Coordinate Geometry 2D
PAPER CODE	xxxx
CREDITS	6

This course is offered to students who opt for Mathematics as their generic /elective.

(i) The objective of this paper is to enable the students with basic idea of dealing with calculus, vectors, co – ordinate geometry and real analysis.

(ii) Students will also learn about their applications in their respective fields like Statistics, Physics, Chemistry, Geology, CA/IT, Economics etc.

SEMESTER – II

TITLE OF THE PAPER	Analysis I
PAPER CODE	xxxx
CREDITS	6

On the completion of the course, students will be able to:

(i) The course will develop a deep and rigorous understanding of real line and of defining terms to prove the results about convergence and divergence of sequences and series of real numbers.

(ii) These concepts have wide range of applications in real life scenario.

(iii) Understand many properties of the real line and learn to define sequence in terms of functions.

(iv) Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.

(v) Apply the ratio, root, Alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.

TITLE OF THE PAPER	Integral Calculus & Analytic Geometry 3D
PAPER CODE	xxxx
CREDITS	4

On the completion of the course, students will be able to:

(i) Sketch curves in a plane using its mathematical properties in the different coordinate systems.

(ii) Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.

(iii) Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

TITLE OF THE PAPER	Integral Calculus & Analytic Geometry 3D
PAPER CODE	xxxx
CREDITS	2

On the completion of the course, students will be able to:

(i) Use MATLAB Code in Mathematical functions.

(ii) For plotting functions, animations and various applications of matrices.

TITLE OF THE PAPER	Integral Calculus, Vector Calculus & Trigonometry
PAPER CODE	xxxx
CREDITS	6

This course is offered to students who opt for Mathematics as their generic /elective.

(i) The objective of this paper is to enable the students with basic idea of dealing with calculus, vectors, co – ordinate geometry and real analysis .

(ii) Students will also learn about their applications in the respective fields like Statistics, Physics, Chemistry, Geology, CA/IT, Economics etc.

SEMESTER – III

TITLE OF THE PAPER	Theory of Real Functions
PAPER CODE	xxxx
CREDITS	6

On successful completion of this paper students will learn:

(i) This course will enable the students to learn to have a rigorous understanding of the concept of limit of a function.

(ii) It is a basic course on the study of real valued functions that would develop an analytical ability to have a more matured perspective of the key concepts of calculus, namely, limits, continuity, differentiability and their applications.

(iii)The geometrical properties of continuous functions on closed and bounded intervals.

(iv)The applications of mean value theorem and Taylor‘s theorem.

(v) Some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.

TITLE OF THE PAPER	Group Theory & Matrices I
PAPER CODE	xxxx
CREDITS	6

On successful completion of this paper students will learn to:

(i) The objective of the course is to introduce the fundamental theory of groups and their homomorphisms.

(ii) Recognize the mathematical objects that are groups, and classify them as Abelian, cyclic and permutation groups, etc;

(iii) Link the fundamental concepts of Groups and symmetrical figures;

(iv) Analyze the subgroups of cyclic groups;

(v) Explain the significance of the notion of cosets, normal subgroups, and factor groups.

(vi) The primary objective of this course is to introduce the basic properties of matrices to understand their linkage to the real-world problems.

TITLE OF THE PAPER	Differential Equations
PAPER CODE	xxxx
CREDITS	6

The course consists of integral and differential calculus.

(i) The great utility of the subject emanates from its use in solving differential equations.

(ii) This is a core course that will help the students in further studies involving Statistics and Mathematics.

(iii) The main objectives of this course are to introduce the students to the exciting world of Differential Equations.

(iv) This course is to teach students to form and solve partial differential equations and use them in solving some physical problems.

(v) Formulate, classify and transform partial differential equations into canonical form.

(vi) Solve linear and non-linear partial differential equations using various methods; and apply these methods in solving some physical problems.

TITLE OF THE PAPER	Logic and Sets
PAPER CODE	xxxx
CREDITS	2

On successful completion of this paper students will learn to:

(i) This course aims at introducing the concepts of Boolean algebra.

(ii) The course discusses some important applications of Boolean algebra in real life situations.

(iii) After the course, the student will be able to understand the concepts of Boolean algebra and their applications;

TITLE OF THE PAPER	Real Analysis I, Group Theory & Differential Equations
PAPER CODE	xxxx
CREDITS	6

This course is offered to students who opt for Mathematics as their generic /elective.

(i) The objective of this paper is to enable the students with basic idea of dealing with Real Analysis, Set Theory, Real functions of two variables, their limit, continuity and differentiability, Abstract Algebra and Differential Equations.

(ii) Students will also learn about their applications in the respective fields like Physics, Chemistry, Geology, CA/IT, Economics etc.

SEMESTER – IV

TITLE OF THE PAPER	Analysis II
PAPER CODE	xxxx
CREDITS	6

On the completion of the course, students will be able to:

(i) To understand the extension of the studies of single variable differential and integral calculus to functions of two or more independent variables by which these concepts may be analyzed and visualized to have a better understanding.

(ii) The conceptual variations when advancing in calculus from one variable to multivariable discussions.

(iii)Inter-relationship amongst the line integral, double and triple integral formulations.

(iv)Applications of multi variable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc.

TITLE OF THE PAPER	Mechanics I
PAPER CODE	xxxx
CREDITS	6

On the completion of the course, students will be able to:

(i) The course aims at understanding the various concepts of physical quantities and the related effects on different bodies using mathematical techniques. It emphasizes knowledge building for applying mathematics in physical world.

(ii) The significance of mathematics involved in physical quantities and their uses;(iii)To study and to learn the cause-effect related to these; and

(iv)The applications in observing and relating real situations/structures.

TITLE OF THE PAPER	Ring Theory & Matrices II
PAPER CODE	xxxx
CREDITS	6

On the completion of the course, students will be able to:

(i) The primary objective of this course is to introduce the basic tools of Ring Theory of matrices to understand their linkage to the real-world problems.

(ii) The fundamental concept of Rings, Fields, subrings, integral domains.

(iii)The basic concepts of ring of polynomials and irreducibility tests for polynomials over ring of integers, used in finite fields with applications.

(iv) Appreciate the significance of unique factorization in rings and integral domains.

(v) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.

(vi) Find eigenvalues and corresponding eigenvectors for a square matrix.

TITLE OF THE PAPER	Graph Theory
PAPER CODE	xxxx
CREDITS	2

On the completion of the course, students will be able to:

(i) This course aims at introducing the concepts of graph theory.

(ii) The course discusses some important applications of Boolean graph theory in real life situations.

(iii) Graphs, their types and its applications in study of shortest path algorithms.

TITLE OF THE PAPER	Real Analysis II, Complex Variable, Set Theory & Matrices
PAPER CODE	UGEMATH 404
CREDITS	6

This course is offered to students who opt for Mathematics as their generic /elective.

(i) The objective of this paper is to enable the students with basic idea of dealing with Real Analysis, Set Theory, Complex variables, Abstract Algebra and Differential Equations.

(ii) Students will also learn about their applications in the respective fields like Statistics, Physics, Chemistry, Geology, CA/IT, Economics etc.

SEMESTER – V

Title of Paper	Analysis III (Metric Space & Complex Analysis)
Course Code	xxxx
Credits	6

After successful completion of this course, students should have developed a clear understanding of:

(i) This course is to introduce the basic tools of complex numbers to understand their linkageto the real-world problems.

(ii) The course aims at providing the basic knowledge pertaining to metric spaces such as open and closed balls, neighborhood, interior, closure, subspace, continuity, compactness, connectedness etc.

(iii) Correlate these concepts to their counter parts in real analysis;

(iv) Appreciate the abstractness of the concepts such as open balls, closed balls, compactness, connectedness etc. beyond their geometrical imaginations.

(v) This course aims to introduce the basic ideas of analysis for complex functions in complex variables with visualization through relevant practicals.

(vi) Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.

Title of Paper	Linear Algebra
Course Code	xxxx
Credits	6

On successful completion, this course will enable the student to:

(i) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.

(ii) Find eigenvalues and corresponding eigenvectors for a square matrix.

(iii) Compute with the characteristic polynomial, eigenvalues, eigenvectors, and eigenspaces, as well as the geometric and the algebraic multiplicities of an eigenvalue and apply the basic diagonalization result.

(iv) Compute inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization to obtain orthonormal basis.

Title of Paper	Number Theory
Course Code	xxxx
Credits	6

After successful completion of this course, student should have developed a clear understanding of:

(i) The primary objective of this course is to introduce the basic tools of number theory to understand the real-world problems.

(ii) Apply Euclid‘s algorithm and backwards substitution to find greatest common divisor.

(iii) In number theory there are challenging open problems which are comprehensible at undergraduate level, this course is intended to build a micro aptitude of understanding aesthetic aspect of mathematical instructions and gear young minds to ponder upon such problems. Also, another objective is to make the students familiar with simple number theoretic techniques, to be used in data security.

Title of Paper	Probability & Statistics
Course Code	xxxx
Credits	6

After successful completion of this course, student should have developed a clear understanding of:

- To make the students familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty or randomness. The course intends to render the students to several examples and exercises that blend their everyday experiences with their scientific interests.

- Distributions to study the joint behavior of two random variables.
- To establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.

SEMESTER – VI

Title of Paper	Mechanics II
Course Code	xxxx
Credits	6

On completion of the course, students should have achieved the following:

(i) The course aims at understanding the various concepts of physical quantities and the related effects on different bodies using mathematical techniques. It emphasizes knowledge building for applying mathematics in physical world.

(ii) The significance of mathematics involved in physical quantities and their uses;(iii)To study and to learn the cause-effect related to these; and

(iv)The applications in observing and relating real situations/structures.

Title of Paper	Numerical Analysis
Course Code	xxxx
Credits	6

After successful completion of this course, student should have developed a clear understanding of:

(i) Some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain given level of precision.

(ii) Interpolation techniques to compute the values for a tabulated function at points not in the table.

(iii)Applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.

Title of Paper	Linear Programming
Course Code	xxxx
Credits	6

After successful completion of this course, student should have developed a clear understanding of:

(i) This course develops the ideas underlying the Simplex Method for Linear Programming Problem, as an important branch of Operations Research. The course covers Linear Programming with applications to Transportation, Assignment Problem etc. Such problems arise in manufacturing resource planning and financial sectors.

(ii) Analyze and solve linear programming models of real life situations.

(iii) The graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of the simplex method is developed.

(iv) The relationships between the primal and dual problems and their solutions with applications to transportation, assignment problems etc.

Title of Paper	Special Functions
Course Code	xxxx
Credits	6

After successful completion of this course, student should have developed a clear understanding of:

(i) The main objectives of this course are to introduce the students to the exciting world of Special Functions and their applications.

(ii) Solve first order linear differential equations of higher order using various techniques.

(iii) Also, get some knowledge of Laplace Transform etc.

Title of the Paper	**MATHEMATICAL PHYSICS-1**
Course code	PHYCC 101 A & PHYCC 101 B
Credits	4 +2
Total Hours	60 + 25

(i)Being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behaviour such as fabricating, falsifying or misrepresenting data;

(ii) the ability to identify the potential ethical issues in work-related situations;

(iii)be committed to the free development of scientific knowledge and appreciation

(iv)its universal appeal for the entire humanity;

(v) promoting safe learning and working environment.

After successful completion of the course the students are expected to:

CO1: Introduction to the idea of fields

CO2: How differential calculus is extension of vector calculus. Scope and application of vector calculus to fields.

CO3: Introduction to various 3D differential operators, their physical significance and form in various coordinate systems and hence applications to problems.

CO4: Introduction to integral vector calculus, theorems therein and their physical significance.

CO5: Learn differential equations of first order in different forms viz. exact differential, homogenous and equations reducible to homogenous, evaluation of integrating factor, proper substitution of complex problems etc.

CO6: Study to calculate complementary function (C,F.) and particular integral (P.I.) of second order differential equations and implement the acquired mathematical knowledge to frame and solve differential equations at different physical situations.

CO7: Familiarize with the mathematical tools of Wronskian, Constrained maximization, Lagrange‘s multipliers, existence and uniqueness theorems to solve initial value problems.

CO8: General introduction to scientific computing, error analysis, basic numerical methods and algorithms.

CO9: Understanding the fundamentals of C and C++ programming for applications in computing differential equations at different physical situations.

Title of Paper	**MECHANICS**
Course Code	PHYCC102A
Credits	3+1
Total Hours	49(Guided)+ 15 (Unguided)

On successful completion of the course students are expected to have understood

CO1: conservation laws of linear momentum, impulse, variable mass system, motion of rocket and their applications to basic problems.

CO2. inertia and learned to calculate moment of inertia of various rigid bodies.

CO3: central force motion through energy equation and energy diagram , and to apply Kepler‘s law to describe the motion of planets and satellite in circular orbit, through the study of law of Gravitation.

CO4: the fundamentals of harmonic oscillator model, including damped and forced oscillators, and grasp the significance of terms like quality factor and damping coefficient

CO5: the basics of material properties like, elasticity, elastic constants and their relation, torsion of a cylinder and torsional rigidity, and to learn Poiseuille's equation for flow of a liquid through a capillary Tube.

CO6: that how fictitious forces-centrifugal and Coriolis force arise in a non-inertial frame.

CO7: the fundamentals of different types of frames of references and transformation laws-both Galilean and Lorentz transformation; origin of fictitious forces-centrifugal and coriolis force arise in a non-inertial frame.

CO7: Basic concepts 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.

Title of the paper	**ELECTRICITY AND MAGNETISM**
Course Code	**CC 203 A**
Credits	**3+1**
Total hours	**51**

Title of Paper	**MECHANICS (PRACTICAL)**
Course Code	PHYCC102B
Credits	2
Total Hours	36

On successful completion of the course students are expected to have understood

CO1: Use of Vernier callipers, screw gauge and travelling microscope, and necessary precautions
during the different experiments.

CO2: Basics about the errors, their propagation and recording in final result up to correct significant digits.

CO3: The linearization of data and the use of slope and intercept to determine unknown quantities.

CO3: Way of writing of scientific laboratory reports, which may include theoretical and practical significance of the experiment performed, apparatus description, relevant theory, necessary precautions to be taken during the experiment, proper recording of observations, data analysis, estimation of the error and explanation of its sources, correct recording of the result of the experiment

After successful completion of the course the students are expected to:

CO1: Understand the application of Coulomb‘s law for the electric field, and also apply it to systems of point charges as well as line, surface, and volume distributions of charges,

CO2: Understand of the relation between electric field and potential, exploit the potential to solve a variety of problems, and relate it to the potential energy of a charge distribution, Multipole expansion and potential due to volume distribution of dipoles, Field energy density

CO3: Apply Gauss‘s law of electrostatics to solve a variety of problems, understand polarization, displacement vector, dielectric constant, polarizability, derivation and application of Clausius-Mossotti Relation and Langevin- Debye equation

CO4: Learn derivation and application of Poisson‘s equation and Laplace‘s equation to problems defined in Cartesian, spherical-polar and cylindrical coordinate systems

CO5: Learn the method of image charges to solve different problems on finding potential and field due to suitable charge distributions

CO6: Develop the understanding of properties of magnetic field such as curl, divergence and vector potential. Also understand the magnetic force in different situations.

CO7: Gain detailed knowledge of magnetic properties of matter.

CO8: Learn Complex number method to analyse different types of AC circuits and understand transient currents, learn skill of deriving the theories of different AC bridges and drawing their vector diagrams.

CO9: Learn three phase Ac generation and distribution systems.

CO10: Learn in detail about dead beat and ballistic galvanometer with theory and application.

CO11: Develop problem solving skills through two assignments, which are set of numerical problems that they have to solve on their own and they have to appear for a test based on those assignments.

Title of paper	Electricity and Magnetism
Course Code	PHY CC 306 B
Credits	2
Total Hours	30

After successfully completing the experiments the students are able to

CO1: Achieve the motor skills of joining various complex circuits with DC and AC.

CO2: Use of dead beat and ballistic galvanometer for different circuits and bridges.

Title of Paper	**WAVES AND OPTICS**
Course Code	PHYCC204A
Credits	3+1
Total Hours	54(Guided)+15 (Unguided)

On successful completion, this course will enable the student to

CO1: Recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems.

CO2: Apply basic knowledge of principles and theories about the behaviour of light and the physical environment to conduct experiments.

CO3: Understand the principle of superposition of waves and formation of standing waves.

CO4:Explain several phenomena we can observe in everyday life that can be explained as wave phenomena.

CO5:Use the principles of wave motion and superposition to explain the Physics of interference and diffraction.

CO6: Understand the working of selected optical instruments like biprism, interferometer, and diffraction grating.

Title of Paper	**WAVES AND OPTICS (PRACTICAL)**
Course Code	PHYCC204B
Credits	2
Total Hours	36

On successful completion, this course will enable the student to

CO1:Gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc.

CO2:Learn about resolving power of optical.

CO3: Determine refractive index of material of prism using sodium light source and spectrometer through the concept of minimum deviation.

Title of the Paper	**MATHEMATICAL PHYSICS-II & COMPUTER LAB**
Course code	PHYCC 305 A & PHYCC 305 B
Credits	4 +2
Total Hours	40 + 25

After successful completion of the course the students are expected to:

CO1: Understanding Frobenius methods of different configurations to solve special functions viz. Legendre‘s , Bessel‘s , Hermite and Laguerre differential equations.

CO2: Familiarize with the terms of special functions i.e. Orthogonality condition, generating function and Rodrigue‘s formula to solve physical problems of projection operator, multipole charge expansion etc.

CO3: Learn the difference between discrete and continuous error functions in the context of error parameters i.e. mean deviation, mean absolute deviation and standard deviation.

CO4: Learning the basics of least-square fit for different experimental working variables representing physical quantities.

CO5: Ability to expand a function in the form of Fourier series and determine harmonic constants. This understanding is used to study the characteristics of different continuous time-signals.

CO6: To learn integrals in the form of gamma and beta function. The mastery of this topic is explored to solve problems of wave-packet distribution and perturbation theory.

CO7: Introduction to the numerical computer software Matlab. In this context students learn the basic properties and programming commands of the software.

CO8: Using Matlab students learn to verify and interpret different physical situations viz. Ohm‘s law, Hooke‘s law, mesh equations of electric circuits, coupled spring mass system etc.

CO9: Learn to apply the software Matlab to compute acoustical vibrations of damped and forced nature.

CO10: The ability to simulate and analyse different forms of continuous waves i.e. square waves, sine waves and saw-tooth waves

Title of the paper	THERMAL PHYSICS
Course code	CC 306 A
Credits	4(3+1)
Total hours	53

After completion of the course the students should be able to explain and describe

CO1: The analysis and synthesis of relation between heat and work and its application on heat engines. Understanding of second law of thermodynamics in elaborate way.

CO2: The concept of entropy with its different properties and study of third law of thermodynamics.

CO3: The ideas, properties and applications of thermodynamical potentials.

CO4: The mathematical and physical understanding of Maxwell‘s thermodynamical relations and developing the skill of solving problems involving different thermodynamical processes.

CO5: The idea of law of distribution of velocities of ideal gas, law of equipartition of energy and other related concepts.

CO6: Mean free path in gases and transport phenomena in ideal gas.

CO7: The properties of real gas. Derivation of Van der Waal‘s equation of state through Virial theorem. Joule-Thomson experiment.

Title of the paper	THERMAL PHYSICS
Course code	CC 306 B
Credits	2
Total hours	30

After completion of the experiments the students are

CO1: Developing the skill of handling and performing experiments using thermal instruments such as platinum resistance thermometer, lees disc, Searl‘s apparatus, thermocouple etc.

CO2: learning the skills of accurate measuements of temperatures and drawing related graphs.

Title of Paper	Digital Systems and Applications
Course Code	PHY CC307A
Credits	3+1
Total Hours	52

This is one of the core paper in physics curriculum, which introduces the concept of Boolean algebra and
the basic digital electronics. In this course, students will be able to understand the working principle of
Data processing circuits, Arithmetic Circuits, sequential circuits like registers, counters etc. based on flip-flops.
As the successful completion of the course, the student is expected to be conversant with the following:

CO-1. Secure first-hand idea of different components including both active and passive components to
gain an insight into circuits using discrete components and also to learn about integrated circuits.

CO-2 About analog systems and digital systems and their differences, fundamental logic gates, combinational as well as sequential and number systems.

CO-3 Synthesis of Boolean functions, simplification and construction of digital circuits by employing
Boolean algebra.

CO-4 Sequential systems by choosing Flip-Flop as a building bock- construct multivibrators, counters to
provide a basic idea about memory including RAM, ROM and also about memory organization.

CO-5. To construct both combinational circuits and sequential circuits by employing NAND as building
blocks and demonstrate Adders, Subtractors, Shift Registers, and multivibrators using 555 ICs.

Title of the Paper	**MATHEMATICAL PHYSICS-III & COMPUTER LAB**
Course code	PHYCC 408 A & PHYCC 408 B
Credits	4 +2
Total Hours	60 + 25

CO-6. Learn about the architecture of 8085 microprocessor and various timing diagrams.

Title of Paper	Digital Systems and Applications Lab
Course Code	SPHY CC307B
Credits	2
Total Hours	30

The objective of the course to understand digital electronics practically and to get an idea to develop
digital circuit design for various purpose.

CO-1. Understand construction and use of CRO, and other experimental apparatuses used in the lab, including necessary precautions.
CO-2. Learn about the basic component of digital electronics and to circuit design.
CO-3. Hand on experience on Digital electronics.
CO-4. Idea of function of common electronic devices and different digital ICs.
CO-5. Design and development of digital circuits.
CO-6. Use of different types of digital ICs.

After successful completion of the course the students are expected to:
CO1: Learn about the complex numbers and their graphical representation; and to execute various algebraic operations like addition, subtraction, multiplication and division of complex numbers.
CO2: Learn to find roots of a complex numbers, complex exponential and complex logarithms.
CO3: Learn about functions of complex numbers and their properties such as analyticity, singularity, poles and their order etc.
CO4: Learn about applications of analytic functions and harmonic functions in various physical and mathematical problems through use of Cauchy-Riemann equations.

CO5:Learn about integral of complex function through parametric representations , Cauchy‘s integral theorem and Cauchy‘s integral formula.

CO6: Understanding Fourier integral theorem in complex and trigonometric form.

CO7: Familiarize with the mathematical operations of integral transforms i.e. Laplace transforms and Fourier transforms.

CO8: Learning the manifestation of integral transforms in consolation and integral semblance.

CO9: Understanding the meaning of ‗Convolution‘ and deduction of Convolution theorem using Fourier and Laplace transformations.

CO10: Applications of integral transformations in different physical situations i.e. Heat flow equations, electrical circuits, differential equations and damped harmonic oscillators etc.

CO11: The ability to formulate Fourier complex transforms in Reciprocal lattice and vector translations in crystallography.

CO12: To analyse and interpret differential equations and Dirac-delta function using Matlab.

CO13: Computation of Fourier constants and special functions conditions i.e. orthogonality and generating function and simulate of experimental observations using method of least-square fit.

Title of Paper	**ELEMENTS OF MODERN PHYSICS**
Course code	**PHYCC409 A+B**
Credits	**4+2**
Hours	**60+30**

A

This course provides the students

- **CO1.** The idea of inadequacies of classical mechanics and the historical development of Quantum aspects.
- **CO2.**The meaning of wavefunction and probability interpretation associated with wavefunction.
- **CO3.** Formulation of Schrodinger‘s equation and solution of its time independent part for selected problems: Potential step, Potential barrier and Particle in a box.
- **CO4.**Connection between measurement results and the uncertainty relation.

CO5. Decay rates and lifetime of radioactive decays like alpha beta gamma decay. Neutrino, antineutrino, their properties and their role in explanation of beta decay.

CO6. Spontaneous and stimulated emission of radiation, optical pumping and population inversion.

CO7. Rate equation for three level lasers and their application in the study of Ruby laser and He-Ne laser.

B

This course provides the students

CO1. Idea of determination of Planck‘s constant by various technique: Black body radiation, LED‘s of different wavelength

CO2. Firsthand experience of using laser source for determination of circular aperture and wavelength of the source through diffraction grating.

Title of Paper	Analog Systems and Applications
Course Code	PHY CC410A
Credits	3+1
Total Hours	47

This course introduces the concept of semiconductor devices and their applications. It also emphasizes on understanding of amplifiers, oscillators, operational amplifier and their applications.

At the end of the course the student is expected to assimilate the following and possesses basic knowledge of the following.

CO-1. N- and P- type semiconductors, mobility, drift velocity, fabrication of P-N junctions; forward and reverse biased junctions.

CO-2 Application of PN junction for different type of rectifiers and voltage regulators.

CO-3 To characterize various devices namely PN junction diodes, LEDs, Zener diode, solar cells, PNP and NPN transistors. Also, construct amplifiers and oscillators using discrete components.

CO-4 NPN and PNP transistors and basic configurations namely common base, common emitter and

common collector, and also about current and voltage gain.

CO-5 Biasing and equivalent circuits, coupled amplifiers and feedback in amplifiers and oscillators.

CO-6 Operational amplifiers and knowledge about different configurations Demonstrate inverting and

non-inverting amplifiers using op-amps. Application of Operational amplifiers

Title of Paper	Analog Systems and Applications Lab
Course Code	SPHY CC410B
Credits	2
Total Hours	30

The objective of this course is to setup various types of laboratory experiments on analogue electronics

and understand some different concept of electronics.

COURSE LEARNING OUTCOME

Through the various experiments in the laboratory a student will learn

CO-1. Construction and use of specific analogue devices and experimental apparatuses used in the lab,

including necessary precautions.

CO-2. Hand on experience on analogue electronics related phenomena.

CO-3. Idea of signal processing application.

CO-4. Data analysis, error calculation and laboratory report preparation

Title of Paper	**QUANTUM MECHANICS AND ATOMIC PHYSICS**
Course code	**PHYCC511A+B**
Credits	**4+2**
hours	**60+30**

A

This course provides the students

CO1. Solution of time dependent Schrodinger equation and general idea of time evolution of a wavefunction, with specific cases: free particle and simple harmonic oscillator.

CO2. Eigenvalues and Eigenfunctions of a harmonic oscillator and probability interpretation of the wavefunction.

CO3. Particle confined in finite potential well is studied in detail.

CO4. Eigenvalues of angular momentum, its z component and space quantization.

CO5. Schrodinger equation is applied to hydrogen atom for determining the shape of the probability densities for ground & first excited states.

CO6. Splitting of spectral lines in the presence of magnetic and electric fields is studied: Zeeman effect and Stark effect.

CO7. Addition of angular momentum for low and high mass number elements is discussed.

B

This course provides the students

CO1. Solving Schrodinger equation using C programming.

Title of the Paper	**SOLID STATE PHYSICS & PHYSICS LAB**
Course code	PHYCC 512 A & PHYCC 512 B
Credits	4 +2
Total Hours	45 + 25

After successful completion of the course the students are expected to:

CO1: Familiarize with the basic concepts of crystallography viz. Bravais lattice, Reciprocal lattice, Miller indices, Brillouin zones, Lattice translation vectors etc.

CO2: Understanding diffraction of X-rays in crystals and interpretation of Bragg‘s law.

CO3: Learn the fundamentals of vibrations and phonon frequency in monoatomic and diatomic lattices.

CO4: Study the basics and mathematical interpretation of specific heat of solids stated by Dulong et al., Debye and Einstein.

CO5: Understanding magnetization of matter in the context of diamagnetic, paramagnetic and ferromagnetic materials.

CO6: Learn the classical Langevin‘s theories of diamagnetism and paramagnetics. Analyse and compare classical theory with Van- Vleck‘s theory of paramagnetism.

CO7: Understanding the fundamentals of electrons in periodic potential i.e. Bloch theorem, Kronig Penny Model, Band gap and effective mass. In this context students learn classification of materials on the basis of band theory.

CO8: Acquire knowledge of ferroelectric properties of materials and structural phase transitions.

CO9: Gain an understanding of piezoelectric, pyroelectric, ferroelectric and electrostrictive properties in crystals.

CO10: Learning underlying principles of superconductivity and expected to understand the related terminologies i.e. Meissner effect, types of superconductors, London equations, Penetration depth and BCS theory.

C11: Hands on training in practical experiments of viz. PE hysteresis loop of a ferroelectric crystal, calculation of the resistivity of a semiconductor by Four-probe method, determination of Hall coefficient of a semiconductor sample, Quincke‘s tube method to evaluate magnetic susceptibility of solids etc.

Title of Paper	**ADVANCED MATHEMATICAL PHYSICS**
Course Code	PHYDSE501A
Credits	3+1
Total Hours	45(Guided)+15(Unguided)

On successful completion, this course will enable the student to

CO1: Learning of the basic properties of the linear vector space such as linear dependence and independence of vectors.

CO2: Learn about change of basis, isomorphism and homomorphism, linear transformations and their representation by matrices.

CO3: Learning of the basic properties of matrices, different types viz., Hermitian, skew-Hermitian, orthogonal and unitary matrices and their correspondence to physical quantities, e.g, operators in quantum mechanics. They should also learn how to find the eigenvalues and eigenvectors of matrices.

CO4: Learning of basic properties of scalar , vector as tensor of rank zero and rank one repectively, and higher ranks of tensor.

CO5: learning of tensor as multilinear functionals on vector and its application in physical tensor e.g. inertia tensor.
CO5: learning of representation of different types of tensors in various kind of bases and corresponding reciprocal bases..

Title of Paper	**ADVANCED MATHEMATICAL PHYSICS (PRACTICAL)**
Course Code	PHYDSE501B
Credits	2
Total Hours	36

Student will learn to find numerically:

CO1: Multiplication of 3 X 3matrices

CO2: Eigenvalues and eigenvectors of 3 X 3 matrices

CO3: Orthogonal polynomials as eigenfunctions of Hermitian differential operators.

CO4: Determination of the principal axes of moment of inertia through diagonalization.

Title of the Paper	Classical Dynamics
Course Code	PHYDSE 502
Credits	5 + 1
Total Hours	75 + 15

After successful completion of the course, a student is expected to

CO1: Understand the fundamental concepts of analytical mechanics such as generalized coordinates, momenta, force, virtual work and use differential method of derivation of Lagrange‘s equations of motion.

CO2: Learn calculus of variations, application to different physical problems of maxima and minima such as equation of curve for minimum surface of revolution, Brachistochrone problem etc., Hamilton‘s principle, derivation of Lagrange and Hamilton equations, and the advantages of these formulations over Newtonian formalism, cyclic coordinates and the relation between symmetries and conserved quantities as well as the use of Poisson brackets.

CO3: Have imbibed ability to use the Lagrange‘s and Hamilton‘s equations to solve complex mechanical problems, understand Canonical transformation concepts and use it to solve problems, Hamilton-Jacobi method and its applications

CO4: Understand the intricacies of motion of particles in central force field, Rutherford Scattering and Scattering cross-section both in centre of mass and laboratory frames, critical thinking and problem-solving skills and to use phase space based arguments to achieve a qualitative understanding of the existing solutions.

CO5: Understand the fundamental concepts of special theory of relativity and their physical consequences, learn use of four-vectors such as 4-veocity, 4-momentum, 4-force and their use in covariant formulations of physical laws such as Maxwell‘s Field equations

CO6: Appreciate that the magnetic forces can be interpreted as relativistic effects and represent those parts of the transformed forces which depend on the velocity of the test charge relative to the observer, understand the transformation of different components of electric and magnetic fields under Lorentz transformation and their intricate relationship from the viewpoint of Special Relativity.

CO7: Develop problem solving skills through two assignments, which are set of numerical problems that they have to solve on their own and they have to appear for a test based on those assignments

Title of Paper	**ELECTROMAGNETICTHEORY**
Course code	**CC613A+B**
Credits	**4+2**
hours	**60+30**

A

CO1. Insights of Maxwells equations and their importance for the development of electromagnetic theory.

CO2. The understanding of propagation of electromagnetic radiation in unbounded media like vacuum, dielectric, conducting media.

CO3. The understanding of electromagnetic wave propagation in bounded media: reflection and transmission coefficients at plane interface in bounded media, evanescent wave.

CO4. Understanding polarization and the mechanism of polarization: Birefringence, Dichroism, Reflection and Scattering.

CO5. Production and detection of linearly, circularly and elliptically polarized light.

CO6. Development of wavefront in positive and negative uniaxial crystals.

CO7. Introduction to Optical Activity, Biot‘s Laws and Fresnel‘s Theory of optical rotation.

B

CO8. First hand idea of production of linearly polarized light by reflection and verification of Brewster‘s law.

CO9. Live view of optical rotation by sugar solution with varying concentrations.

Title of the Paper	Statistical Mechanics
Course Code	PHYCC 614 A
Credits	3+ 1
Total Hours	45 + 15

After successful completion of the course, a student is expected to

C01: Understand basic statistical methods and the concepts of microstate, macrostate, phase space, thermodynamic probability and partition function, use of Ensemble method and understand the use of Thermodynamic probability and Partition function for calculation of thermodynamic variables for physical system.

CO2: Learn application of the classical statistical mechanics to derive the law of equipartition of energy and specific heat, the Gibbs paradox and its resolution, learn derivation of Sackur – Tetrode formula and its meaning

CO3: Understanding of the combinatoric studies of particles with their distinguishable or indistinguishable nature and conditions which lead to the three different distribution laws e.g. Maxwell-Boltzmann distribution, Bose-Einstein distribution and Fermi-Dirac distribution laws of
particles and their derivation.

CO4: Understand the properties and Laws associated with thermal radiation, learn to apply the Fermi- Dirac distribution to model problems such as electrons in solids, apply the Bose-Einstein distribution to model problems such as blackbody radiation and Helium gas.

CO5: Understand the concept of Fermi energy and Fermi level, calculate the macroscopic properties of lightly and strongly degenerate Fermi gas, electron gas in metals and their properties.

CO6: Develop problem solving skills through two assignments, which are set of numerical problems that they have to solve on their own and they have to appear for a test based on those assignments

Title of the Paper	Statistical Mechanics
Course Code	PHYCC 614 B
Credits	2
Total Hours	30

CO1: In the laboratory course, with the exposure in computer programming and computational techniques, the student will be in a position to perform numerical simulations for solving the problems based on Statistical Mechanics

Title of Paper	**NUCLEAR AND PARTICLE PHYSICS**
Course code	**DSE603A**
Credits	**4+2**
Hours	**60 (Theory)+30 (Tutorial)**

The course provides the student with:

CO1. The basic idea of properties of the nucleus such as shape size and radius density magnetic moment, electric quadrupole moment etc.

CO2. Concept of binding energy, the various factors which determine the binding energy and dependence of binding energy per nucleon curve.

CO3. One complete unit is dedicated to radioactivity as it finds immense applications in modern medical applications, radio physics, etc.

CO4. Detailed idea of various types of ion accelerators, which serve as important tools in wide range of research areas.

CO5. Knowledge on the basic aspects of particle Physics – the fundamental interactions, elementary and composite particle.

CO6. Classifications of particles: leptons, hadrons (baryons and mesons), quarks, gauge bosons and quark model.

CO7. Understanding about the quantum numbers of particles, energy, linear momentum, angular momentum, isospin, electric charge, colour, strangeness, lepton numbers, baryon number and the conservation laws associated with them.

CO8. Application of conservation laws in interaction amongst various elementary particles to check whether the interactions are possible or forbidden.

Title of Paper	Physics of Devices and Instruments
Course Code	PHYDSE604 A
Credits	3+1
Total Hours	45

This paper is based on advanced electronics which covers the devices such as UJT, JFET, MOSFET, CMOS
etc. Digital Data parallel Communication . Asynchronous and synchronous transmission, and different encoding schemes. Standards are described along with the understanding of communication systems.
At the successful completion of the course the students are expected to master the following.

CO-1. UJT, JFET, MOSFETs
CO-2. Power Supply and the role of Capacitance and Inductance filters.
CO-3. Active and passive filters and various types of filters.
CO-4. Multivibrators using transistors.
CO-5. Concepts of parallel and serial communication and knowledge of Synchronous and Asynchronous
transmission.
CO-6. Basic idea of communication including different modulation techniques.

Title of Paper	LAB
Course Code	PHYDSE604 B
Credits	2
Total Hours	30

The main objective of this laboratory component of DSE-4, is to understand the working principle

of various types of electronic components and provide the core understanding of different amplifiers,
and oscillators.

CO-1 Learning of the construction and use of other experimental apparatuses used in the lab, including
necessary precautions.

CO-2. Practical experience of the characterizes of semiconductor devices like JFET, MOSFET and
different types of amplifiers and oscillator circuits.

CO-3. Review of experimental data analysis, writing of scientific laboratory reports including proper
reporting of errors

CO-4. Skills to realize the various network theorems.

Title of Paper	**MECHANICS**
Course Code	PHYGE101A
Credits	4
Total Hours	60

On successful completion of the course students would have understand

CO1: Concept of scalar, vector and their derivatives.

CO2: Ordinary differential equations and their solution

CO3: The motion of objects in different frame of references.

CO4: Laws of motion, reference frames, and its applications in problems like simple harmonic oscillator and damped oscillation.

CO5: The idea of conservation of angular momentum, central forces and the
effective potential, Kepler‘s laws of planetary motion.

CO6: The dynamics of rotating objects i.e. rigid bodies, angular velocity, the moment of inertia, parallel axis theorem, the inertia tensor, the motion of rigid bodies. non-inertial frames: pseudo forces, examples involving the centrifugal force. conservation laws of linear momentum, impulse, variable mass system, motion of rocket and their applications to basic problems.

CO7: the basics of material properties like, elasticity, elastic constants and their relation, torsion of a cylinder and torsional rigidity, and to learn Poiseuille's equation for flow of a liquid through a capillary Tube.
CO8: the fundamentals of different types of frames of references and transformation laws- both Galilean and Lorentz transformation
CO9: concepts of special theory of relativity and its applications to understand length contraction, time dilation, relativistic addition of velocities

Title of Paper	**MECHANICS (PRACTICAL)**
Course Code	PHYGE101B
Credits	2
Total Hours	36

On successful completion of the course students would have understand
CO1: Use of Vernier calipers, screw gauge and travelling microscope, and necessary precautions during the different experiments.
CO2: Basics about the errors, their propagation and recording in final result up to correct significant digits.
CO3: The linearization of data and the use of slope and intercept to determine unknown quantities.
CO3: Way of writing of scientific laboratory reports, which may include theoretical and practical significance of the experiment performed, apparatus description, relevant theory, necessary precautions to be taken during the experiment, proper recording of observations, data analysis, estimation of the error and explanation of its sources, correct recording of the result of the experiment.

Title of Paper	**WAVES AND OPTICS**
Course Code	PHYGE202A
Credits	4
Total Hours	60

On successful completion, this course will enable the student to

CO1: Recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems.

CO2: Apply basic knowledge of principles and theories about the behavior of light and the physical environment to conduct experiments.

CO3: Understand the principle of superposition of waves and formation of standing waves.

CO4:Explain several phenomena we can observe in everyday life that can be explained as wave phenomena.

CO5:Use the principles of wave motion and superposition to explain the Physics of polarization, interference and diffraction.

CO6: Understand the working of selected optical instruments like interferometer, and diffraction grating.

Title of Paper	**WAVES AND OPTICS (PRACTICAL)**
Course Code	PHYGE 204B
Credits	2
Total Hours	36

On successful completion, this course will enable the student to

CO1:Gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment.

CO2:Learn about wave pattern through kundt‘s tube experiment and melde‘s experiment.

CO3: Determine refractive index of material of prism using sodium light source and spectrometer through the concept of minimum deviation.

Title of Paper	**ELECTRICITY AND MAGNETISM**
Course code	PHYGE303A
Credits	**4+2**
hours	**60+30**

The course provides the student with:

CO1. Basic understanding of vector calculus.

CO2. Introduction to electrostatics, Gauss‘s Theorem and Electric field and Potential.

CO3. Application to simple problems in Electrostatics, study of various charge distributions, capacitors etc.

CO4. Introduction to magnetic field, its energy density, different types of magnetic materials and the microscopic origin of magnetism.

CO5. Theoretical understanding of techniques to measure susceptibility and permeability of various types of magnetic materials.

CO6. Introduction to current electricity, electromagnetic induction.

CO7. Analysis of basic circuits like LC, LR and LCR, and their applications in devices like Transformer, three phase ac generator, Induction motor.

CO8. Introduction to thermoelectricity.

Title of Paper	**ELECTRICITY AND MAGNETISM**
Course Code	PHYGE303B
Credits	2
Total Hours	36

CO9. Training to set up various basic electrical circuits for measurement of high and low resistances, AC and DC voltages, comparison of capacitances.

CO10. Experimental study of the figure of merit of a Moving coil galvanometer.

Title of Paper	**THERMAL PHYSICS AND STATISTICAL MECHANICS**
Course code	GEPHY404A
Credits	4
Total Hours	60

This Course provides the student with:

CO1. Knowledge of thermodynamical systems, processes and also all the laws of thermodynamics, along with the knowledge of Carnot‘s cycle and theorem.

CO2. An idea of entropy along with its different properties.

CO3. The skill of solving problems on thermodynamical potentials and Maxwell‘s equations after deducing the equations.

CO4. Detailed study of the law of distribution of velocities and mean free path.

CO5. An understanding of transport phenomena on the basis of gas atoms and molecules.

CO6. Knowledge of thermal radiation along with the derivations of the concerned laws.

CO7. Origin of statistical Mechanics in Physics and general approach of Statistics.

CO8. An Introduction to statistical Mechanical concepts thereby establishing the correspondence between classical thermodynamics and the statistical approach.

CO9. Solution of Basic problems of classical and Quantum statistics.

Title of Paper	**THERMAL PHYSICS LAB**
Course code	GEPHY404B
Credits	2
Total Hours	30

This Course provides the student with:

CO1. Skill to handle work with thermal instruments.

CO2. Techniques of determination of different thermodynamical quantities through experiments and their graphs.

Title of the paper	**Renewable Energy and Energy Harvesting**
Course Code	**SEC-01**
Cerdits	**02**
Total Hours	**30**

Course objective: Since the course does not require a solid base in physics, the student is only expected to develop a understanding of renewable energy techniques

CO1: Qualitative ideas about Solar energy, Physical principle of conversion of solar energy into heat

energy, solar energy harvesting devices like solar cells, solar cookers, solar greenhouses etc CO2 Gets an idea about basic principle of wind energy conversion and basic components of wind energy conversion systems

CO3 Elementary idea of geothermal energy sources, its applications and method of obtaining energy from biomass

CO4. Know about other non-conventional energy sources like Ocean Thermal Energy Resources, Wind energy and Chemical energy resources

Title of the paper	**Weather Forecasting**
Course Code	**SEC-02**
Cerdits	**02**
Total Hours	**30**

Course objective: The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness and understanding regarding the causes and effects of different weather phenomenon and basic forecasting techniques

CO1: Qualitative ideas about atmospheric phenomena, principle of measuring the weather phenomena

CO2: To develop an understanding of Indian monsoon and its effect in Indian economy, tropical cyclones and naming of cyclones and its characteristics

CO3 Elementary idea of climate change and its current debate on international forum together its mitigation measures

CO4. Know about the types of weather forecasting and weather forecasting methods and use of satellite data in forecasting techniques

Department of Zoology

PROGRAMME OUTCOME

This program is one of the most fundamental unit of basic sciences studied at undergraduate level. The program helps to develop scientific tempers and attitudes, which in turn can prove to be beneficial for the society since the scientific developments can make a nation or society to grow at a rapid pace. After studying this program, students will be more equipped to learn and know about different biological systems, their coordination and control as well as evolution, behavior and biological roles of the animals in the ecosystem. Moreover, they will be able to qualitatively and quantitatively analyse evolutionary parameters using various bioinformatics and computational tools used in modern sciences.

After the completion of this course, students have the option to go for higher studies, i.e., M. Sc. / Integrated MS Ph.D. and then do research work for the welfare of mankind. After higher studies, students can join as scientist or assistant professor or assistant teacher and can even look for professional job oriented courses, such as Indian Civil Services, Indian Forest Service, Indian Police Service etc.

Students enrolled in B.Sc. (Hons.) degree program in Zoology will study and acquire complete knowledge of disciplinary as well as allied biological sciences. At the end of graduation, they are likely to possess expertise which will provide them competitive advantage in pursuing higher studies from India or abroad; and seek jobs in academia, research or industries. Students will be able to define and explain major concepts in the biological sciences.

Course Outcomes

NON-CHORDATES I : PROTISTS TO PSEUDOCOELOMATES

Students will have learning about the basic taxonomy and systematics and classification of Protozoa, Porifera, Cnidaria and Helminth groups. They also will acquire knowledge about the biology of these taxonomic categories as well as about some acoelomate plus pseudocoelomate parasites for their life cycles, epidemiology, pathology, diagnosis, symptoms and treatments. They will also have knowledge about the basics of parasitology such as origin and evolution of parasitism, role of vectors, parasitoids, host-parasite interactions etc.

PERSPECTIVES IN ECOLOGY

Students will be understanding the various features and aspects of population ecology, community ecology and ecosystem ecology. They might have the knowledge about environmental biology in details. They will acquire knowledge about various tools and techniques of field ecology.

NON-CHORDATES II : COELOMATES

Students will be learning about classification of coelomate invertebrates and the structure, function plus biology of these taxonomic categories as well. They will understand about different vector born diseases and the related life cycles, epidemiology, pathology, diagnosis, symptoms and treatments. They will also know the basics of sericulture, apiculture and lac culture.

CELL BIOLOGY

Students will understand the structures, positions and functions of plasma membrane and all cellular organelles in details. They will acquire knowledge about chromosomes and cell divisions, both mitosis and meiosis. They will also know about cell signalling and cancers. They will know how to measure and stain different cell types.

DIVERSITY OF CHORDATES

Students will understand the classification, structure, function and biology of chordates of different taxonomic classes. They will also learn some special topics like zoogeography, metamorphosis, snake bites, migration of birds, parental care of amphibian, echolocation of mammals, poultry managements and different breeds of domestic animals.

PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

Students will learn about basics of histology and tissue staining. They will also understand the physiology of muscles, nerves, reproductive systems and bone. They will learn details of endocrinology with classification of hormones, their biosynthesis, receptors, mode of molecular actions, physiological function, feedback controls and related disorders.

FUNDAMENTALS OF BIOCHEMISTRY

Students will understand the basic and fundamental biochemistry of carbohydrates, proteins, lipids and nucleic acids. They will also understand the nature, mechanism, and kinetics of

enzyme action. Some instrumentation such as microscopy, chromatography, electrophoresis, centrifugation, spectrophotometry etc will also be learnt.

COMPARATIVE ANATOMY OF VERTEBRATES

Students will have understood the structures of different systems such as, integumentary, skeletal, digestive, respiratory, circulatory, urinogenital, nervous and sensory organs in comparative way among the vertebrate groups.

PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Students will know the physiology of digestion, respiration, circulation, excretion and adaptation.

METABOLIC PROCESSES:

Students will understand the metabolism of carbohydrates, lipids and proteins in details. They will also learn about oxidative phosphorylation and redox reactions.

MOLECULAR BIOLOGY: Students will acquire knowledge about replication, transcription, translation, post transcriptional and post translational modifications, gene regulation, DNA repair mechanisms and various molecular tools and techniques like PCR, southern, northern and western blotting, recombinant DNA technology etc. They will also know the various tools and techniques related to bacterial microbiology. Some aspects of applied microbiology and diseases related to microbiology will also be learnt by the students.

PRINCIPLES OF GENETICS:

Students will learn the fundamental genetics like Mendelian and Non Mendelian inheritances, linkages, mutations, sex determination of various animals, extrachromosomal inheritances, transposable genetic elements etc. They will also understand the various aspects of biostatistics such as central tendency, t-test, chi-square, ANOVA, correlations and regression.

DEVELOPMENTALBIOLOGY:

Students will learn the different aspects of early, late and post embryonic developments. They will have the knowledge about implications of developmental biology in various fields, such as in teratogenesis, stem cell biology, in vitro fertilization, cryopreservation, cord blood transfusion etc.

EVOLUTIONARY BIOLOGY:

Students will know about population genetics, human evolution, various concepts about origin of species, extinctions, phylogenetic tree making. They will also understand few basic of bioinformatics.

ANIMAL BEHAVIOUR AND CHRONOBIOLOGY

Students will know in details about patterns of behaviours, survival strategies, social and cooperative behaviours, design of signals and chronobiology. They will also know to Construct ethograms.

DSE IMMUNOLOGY:

Students will develope knowledge about structures and function of immune cells, immunoglobulins, antigens and their interactions with antibodies. They will know about MHC molecules, cytokines, hyper sensitivity reactions and cellular mode of immunity development. They will know the immune diffusion technique and ELISA.

DSE – Wild Life Conservation

Student will be learning the various issues related to biodiversity loss and conservation as well as status, conditions and conservation of forest and wildlife. They will also be able to use various tools used in field biology

DSE – Animal Behaviour:

Students will learn details about animal behaviour, mechanism of physiological clock etc.

DSE Endocrinology: Students will learn details about structure and functioning of endocrine glands and hormones.

GE1 Animal Diversity:

Students will have learning about the basic taxonomy and systematics and classification of Animal Kingdom.

GE2 Human Physiology

Students will have a basic idea of Human Physiology.

GE3 Food Nutrition and Health

Students will acquire basic idea about food nutrition and health and hygiene.

GE4 Insect Vectors

Students will get basic introduction to Entomology and have idea about some of the common insect vectors.

SEC1 Sericulture

Student will learn about sericulture and its different perspectives.

SEC2 Aquarium and Fish Keeping

Students will learn about practices associated with aquarium and fish keeping.

Geology

- For B. Sc. Course:
  - In paper GLGCC101A (Earth system science) the students get acquainted with the entire solar system with special reference to earth, its magnetic field and convection current. The get concepts of plate tectonics and it relation to origin of continents, oceans and mountains and major events occurred since the origin of the earth.
  - In paper GLGCC102A (Mineral science) the knowledge of descriptive and optical mineralogy and crystallography is provided.
  - In paper GLGGE101A (Essentials of geology) the meaning and scope of geology and solar system is taught along with the overview to mineralogy and fossils.
  - The paper GLGCC203A (Elements of geochemistry) deals with chemistry of the earth with every layer of the earth and behaviour of the elements.
  - The paper GLGCC204A (Structural geology) the knowledge about the deformations over the earth since is origin is provided.
  - The paper GLGGE202A (Rocks and minerals) provides the knowledge about minerals and rocks, their physical and optical properties and their bases of classification.
  - The paper GLGCC305A (Igneous petrology) provides the knowledge about igneous rocks, their classification, texture, structures and the feature developed during their cooling and the representative rock types.

- In paper GLGCC306A (Sedimentary petrology) the students learn about the processes of sedimentation, particle-fluid interaction, the texture, structure and classification.
- In paper GLGCC307A (Palaeontology) the knowledge of the life of the geological past (vertebrates, invertebrates and palaeobatany) is taught.
- The paper GLGCCSE01 (Field geology) provides the field training (knowledge about toposheet and field equipments).
- The paper GLGGE303A (Fossils and their applications) provides the knowledge about fossils, their application and societal significance.
- In paper GLGCC408A (Metamorphic petrology) the formation of metamorphic rocks, its relation to tectonism and the representative rocks are discussed.
- In paper GLGCC409A (Stratigraphy: Principles and Indian stratigraphy) the principles, codes of stratigraphic nomenclature and Indian stratigraphy is discussed.
- In paper GLGCC410A (Hydrology), the basic concepts, groundwater flow and exploration, groundwater recharge and rainwater harvesting is taught.
- The paper GLGCCSE402 (Field geology-II) provides the knowledge about geological mapping and identification of structure and their stereoplots of structures.
- The paper GLGGE404A (Earth resources) provides the knowledge about earth‘s resources like energy, its sources and groundwater resources.
- The paper GLGCC511A (Economic geology) provides the knowledge about ores, its processes of formation and distribution in India.
- The paper GLGCC512A (Geomorphology) provides the knowledge about various features of the earth and role of natural agents in their formation.
- The paper GLGDSE501A (Exploration geology) provides the knowledge about mineral resources, its prospecting and exploration,

sampling techniques, drilling and reserve estimation and statistical analysis of data.

- The paper GLGDSE502A (Earth and climate) provides the knowledge about climate system, atmosphere, hydrosphere, biosphere and mechanism of monsoon.
- The paper GLGCC613A (Engineering geology) provides the knowledge about planning and designing of dams, tunnels bridges and geological considerations to avoid accidents and natural calamities.
- The paper GLGCC614A (Remote sensing and GIS) provides the knowledge about photo-geology, remote sensing, digital images processing and GIS.
- The paper GLGDSE603A (Fuel geology) provides the knowledge about hydrocarbon resources and their occurrences.
- The paper GLGDSE604A (Introduction to geophysics) provides the knowledge about physics of the earth like its magnetic and electrical field, geophysical methods of prospecting and use of anomalies in geophysical explorations.

B.A. Honours

ENGLISH HONOURS

Programme Specific Outcomes: The B.A. Honoursprogramme in English is a three-year course that aims at imparting to the students:

- a clear idea about the various movements and changes in the history of English literature.
- the ability to read, understand, interpret and analyze independently literary texts in various genres.
- familiarity with major literary theories and some of the major literary texts produced in countries other than England and India.

Course Outcomes:

Core Course 1: The aim is to familiarize students with the major trends, ages and movements in British literature. The course aims to enable students to understand the various literary periods

and changes in the literary history of England up to the 18th century. This constitutes the first part of the study of the literary history and criticism in British literature.

Core Course 2: The course aims to impart students the knowledge of classical European and Indian literature. The students are introduced to a few literary genres like epic and classical drama.

Core Course 3: This paper is the second part of the study of the literary history and criticism in British literature. Students are familiarized with the various literary trends, periods and movements in British literary history from the 19th century to the Postmodern period.

Core course 4: This course deals with literature in English produced in India. The course aims to impart students an understanding of the writings produced in English in India and the characteristics of Indian writings in the various genres like poetry, fiction and drama.

Core Course 5: The students are introduced to literary theory. This course is aimed at familiarizing students with the various theories used for the critiquing, analyzing and interpreting literary texts. The students learn about the fundamental principles and tenets of various literary theories.

Core Course 6: The students are introduced to the study, analysis and interpretation of literature during the various literary periods in England. The course deals with the literature produced in England during the 14th to the 17th centuries. The aim of the course is to familiarize students with the major authors, their works and the characteristics of the literature produced during this period. The focus is on the study of the various genres of literature that dominated the literary scene during the period.

Core Course 7: This course deals with the study of the literature produced in England during the 17th and 18th centuries. The aim of the course is to familiarize students with some of the major authors and their works produced during this period. Students learn to read, interpret and analyze literary texts and gain an understanding of the literary characteristics of the writers, the literary genres and the literary periods.

Core Course 8: This course aims at familiarizing students with 18th century British literature. The students read, learn to analyze, interpret and appreciate the literary works by the prominent writers of the age in different literary genres.

Core Course 9: In this course, the students read the literary works of British authors of the early 19th century. The course dealing with poetry and fiction aims at sensitizing students with the salient characteristics of Romantic literature as manifested in the works of its major authors.

Core Course 10: This course deals with British Victorian literature. The course is aimed at sensitizing students with the salient characteristics of British Victorian literature. The students

learn to interpret and appreciate the works of the leading poets and fiction writers, thereby gaining an understanding of the literary tendencies of the age.

Core Course 11: The students are introduced to an important area of literary studies, namely, the writings of women. Literary studies are incomplete without studying the contribution of women authors to literature. This course therefore, aims at sensitizing students with the writings by women authors in different genres and includes the British, American and Indian authors.

Core Course 12: This course is the culmination of study of the literary periods, movements, trends and changes as reflected in the literary works of British authors. The course deals with 20th century British literature in different genres. It aims at imparting to the students an understanding of the modernist trends and issues dealt by various authors. The students learn to interpret, analyze, appreciate and critique literary works.

Core Course13: The students are introduced to World literature - the literature produced in the different countries of the world. The course includes French, American, Russian and Scandinavian authors in different genres. The students are sensitized to various literary, social and cultural issues and they read, learn to interpret, appreciate and critique literary works.

Core Course 14: The students are introduced to another area of literary studies, namely, Postcolonial literature. The course aims at familiarizing students with the Postcolonial concerns of authors mainly in poetry and fiction. Students learn to critique literary works in the light of Postcolonial theory.

Discipline Centric Elective (DSE) -1: This course deals with the study and analysis of the writings of Modern Indian authors in translation. Students study the translated works in different genres. The course aims at sensitizing students with the social and cultural issues as they are reflected in the works of modern writers.

Discipline Centric Elective (DSE) -2: The students are introduced to the literature of the Indian diaspora. The students are sensitized to the issues pertaining to diaspora lives.

Discipline Centric Elective (DSE) -3: The course enables students to read and learn about literary criticism. The course contains texts by some of the leading literary critics. Students gain knowledge about the best practices in literary criticism.

Discipline Centric Elective (DSE) - 4: This course offers students readings in contemporary literary theory. The aim of the course is to enable students to read and understand critical essays and be familiar with some of the best practices in contemporary literary criticism.

Skill Enhancement Course (SEC) -1: This course deals with imparting students skill in Translation. The students are familiarized with the theory and practice of translation. The objective of the course is to impart the skill of translating texts from the source language to the

target language. It is hoped that students will gain the necessary skills required for greater employability.

Skill Enhancement Course (SEC) -2: This course aims at improving the soft skills of students. It is hoped that with the help of this course, students will be better able to cope with the requirements of various employment opportunities in the competitive social environment.

Generic Elective Course (GE) -1: The aim of this course is to improve and enhance the writing and reading skills of the students. The course deals with teaching the students the basics of good writing and through the reading of prose pieces the purpose is to provide the students practice in reading skills.

Generic Elective Course (GE) -2: The course enables students to read and understand prose pieces. The aim is to enhance the language abilities of students through the reading of prose pieces.

HISTORY HONOURS

Programme Outcomes-

PO1- Demonstrate comprehensive knowledge and understanding of one or more disciplines.

PO2-Develop inter-disciplinary analytical skills and critical thinking.

PO3- Express thoughts and idea effectively in writing and orally.

PO4- Analyze synthesize and integrate knowledge.

PO5- Become employable in government and non government organizations.

Programme Specific Outcomes-

PSO1- Understand the socio cultural heritage of India and other parts of the world.

PSO2- Provide multi-casual explanations of major historical developments based on a contextualized analysis of Regional, Indian and World history.

PSO3- Identify and analyse the significance of historical changes and explain the patterns of such transitions.

PSO4- Demonstrate knowledge of the chronology, narrative and major events of history.

PSO 5- Extract evidences from primary and secondary historical sources by analyzing and evaluating them.

Course Outcomes-

CO1- CCO1- Provide an extensive survey of Early Indian history from pre-historic times to the end of Vedic cultures in India.

CO2-CC02- Explain the significant developments in medieval and modern Jharkhand.

CO3-CC03- Explore the transition from proto-historical to early medieval phase highlighting major changes that shaped the character of the Indian civilization.

CO4-CC04- Develop a historical understanding of the major developments in Jharkhand in the later nineteenth and twentieth centuries.

CO5-CC05- Trace the patterns of change and continuities in the economic,social, political and cultural aspects of life during early medieval India.

CO6-CC06-Trace the transition from feudalism to capitalism in Europe.

CO7-CC07- Explore the history of India between the thirteenth and fifteenth centuries with reference to Delhi Sultanate, regional politics and socio-religious movements.

CO8-CC08- Analyseeconomic,social and political transformations in Europe during the 17^{th} and 18^{th} centuries.

CO9-CC09- Understand the developments that led to the establishment and consolidation of the Mughal state in India.

CO10-CC10- Study the 18^{th} century Kingdoms and early colonial state in India.

Co11-CC11- Explain the French Revolution and its repercussions, impact of industrial capitalism and new social movements in Europe.

CO12-CC12- Understand the chief features of Indian history between the early seventeenth and mid eighteenth centuries.

CO13-CC13- Discuss the socio-economic and political trends in colonial India from the later half of the 19^{th} centuries.

CO14- CC14- Analyse the developments in modern Europe during the19th and 20^{th} centuries.

CO15—DSE01- Give an overview of the history of the USSR from the revolutions of 1917 to the end of the Second World War.

CO16-DSE02- Trace the transformations of china from an Imperial power into a modern nation.

Co17-DSE03- Explain the emergence of the USSR as a super power between1945 and 1991.

CO18-DSE04- Discuss the transition of Japan from a feudal to a modern industrial capitalist nation.

CO19-GE01- Understand the importance of Environment and ecology and highlight environmental issues and movements in colonial and independent India.

CO20- GE02- Demonstrate an understanding of history as an interdisciplinary practice and give an overview of Research methodology.

CO21-GE03- Trace the important development in contemporary India from 1935 to 1970s.

CO22-GE04- Demonstrate knowledge of the issues in contemporary world.

CO23-SEC01- Demonstrate knowledge of the structure and functioning of archives‘ and museums.

CO24-SEC02- Explore the interface between various forms of popular culture and their historical evolution.

ECONOMICS HONOURS

Programme Specific Outcome

Students will:

1. Get an understanding of basic economic theory;

2. Learn the mathematical and statistical techniques necessary for a proper understanding of the discipline;

3. Get an introduction to real world economic issues and problems facing the country and the world;

4. Get trained in the art of economic modeling.

5. Get trained to collect primary data and learn sampling techniques;

6. Learn to use scientific empirical methods to arrive at conclusions about the validity of economic theories;

7. Gain an understanding of proper policy responses to economic problems;

Course Outcome

SEM 1

ECOCC101 Expose the basic principles of microeconomic theory.

ECOCC102 Transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level

ECOGE101 Some basic concepts and terminology that are fundamental to statistical analysis and inference.

SEM 2

ECOCC203 Introduce the basic concepts of Macroeconomic

ECOCC204 To transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level

ECOGE202 Basic concepts and terminology that are fundamental to statistical analysis and inference.

SEM 3

ECOCC305 To provide a sound training in microeconomic theory to formally analyse the behaviour of individual agents.

ECOCC306 Formal modelling of a macro-economy in terms of analytical tools.

ECOCC307 Some basic concepts and terminology that are fundamental to statistical analysis and inference.

ECOSEC301 course introduces students to the economics of finance.

ECOGE303 To expose the students to the field of applied mathematical economics.

SEM 4

ECOCC408 It covers general equilibrium and welfare, imperfect markets and topics under information economics.

ECOCC409 The students are introduced to the long run dynamic issues like growth and technical progress.

ECOCC410 This course provides a comprehensive introduction to basic econometric concepts and techniques.

ECOSEC402 This course introduces the student to collection and presentation of data. It also discusses how data can be summarized and analysed for drawing statistical inferences.

ECOGE404 This course is designed to expose the students to the field of applied mathematical economics.

SEM 5

ECOCC511 This course reviews major trends in economic indicators and policy debates in India in the post-Independence period, with particular emphasis on paradigm shifts and turning points.

ECOCC512 Discussion of alternative conceptions of development and their justification.

ECODSE501 This course exposes students to the theory and functioning of the monetary and financial sectors of the economy.

ECODSE502 The paper deals with the nature of government intervention and its implications for allocation, distribution and stabilization.

SEM 6

ECOCC613 This course examines sector-specific polices and their impact in shaping trends in key economic indicators in India.

ECOCC614 Basic demographic concepts and their evolution during the process of development.

ECODSE603 This course focuses on economic causes of environmental problems.

ECODSE604 This course develops a systematic exposition of models that try to explain the composition, direction, and consequences of international trade, and the determinants and effects of trade policy.

HINDI HONOURS

Hindi is one of the most widely spoken languages not only in the country but also in the world. Because of its flexibility, it is ever growing, ever flourishing. Not only this, its applications in different walks of life are also many. The programme reflects the growth, changes and the current trends in Hindi language and literature. It takes into consideration the changing social norms, patterns of communication, the role of language in the present scenario and the changing social values of our times. Since language carries culture, Hindi too should be perceived not just as a language but also as a carrier of art, culture, music and literature. The programme also aims at developing an understanding of the culture of the places where Hindi is used. The course has been designed such that the students are able to look back at the origins of the language and the culture it represents and at the same time learn to use the language in the context of the contemporary society to fulfil their needs in the present times.

VISION

- To develop critical thinking among students.
- To enable a holistic understanding of language, literature and culture in general and that of the Hindi language and literature in particular.
- To develop among the students a positive outlook and a sense of pride for Hindi.
- To develop Language Proficiency and Communication Skills among students.
- To instil the sense of responsibility among students.
- To inculcate the feeling of patriotism and admiration for the country among students.
- To help students establish a harmonised connection between the traditional and modern ideas of language in general and the Hindi language in particular.
- To enable students to realize the relation between the evolution of thought and culture and the evolution of language.
- To form optimistic, sensitive and mature human beings who can responsible to socio-political causes and calls.

MISSION

- To impart a comprehensive knowledge of Hindi language and literature.
- To acquaint the students with the relevance of Hindi in building careers.
- To enable students to take up Hindi for appearing for the civil service examinations.
- To familiarise the students with the use of Hindi in translation and interpretation.
- To develop a journalistic attitude.
- To enable students to use Hindi as a tool to develop communication skills and other soft skills.
- To make students understand the importance of Hindi in the field of advertisement and marketing.
- To hone the skills of creative writing and writing for media.
- To develop stage skills for programme-hosting and voice over.
- To inculcate leadership qualities among students.
- Personality development.

- To encourage team spirit, mutual cooperation and the ability to improve public relations.
- To enable students to communicate effectively in Hindi as well as local languages and remain connected with people by using modern ways and means like social media.

JOB PROSPECTS

- Teaching – School, College, University
- Administrative Services – Centre and State
- Journalism and Mass Communication
- Editing and Review
- Hindi Officer in Public and Private Sectors
- Translator
- Interpreter
- Anchor, Announcer and Programme Host
- Public Relations Officer
- In the field of Creative Writing and Advertisement

Course Objectives

Semester I

Paper	Objectives
CC1 (Hindi SahityakaItihaas: Aadikaal)	To enable the students to have a comprehensive knowledge of the history of Hindi literature, especially that of Aadikaal. The students shall be able to place literary works against socio-cultural and literary trends and contexts.
CC2 (Hindi SahityakaItihaas: Bhaktikaal)	To enable the students to have a comprehensive knowledge of the history of Hindi literature, especially that of Bhaktikaal. The students shall be able to place literary works against socio-cultural and literary trends and contexts.
AECC-I	To enable the students to acquire an understanding of the basics of the various types of communication and develop their communicative skills.
G.E I	The purpose of this paper is to enable students from varied disciplines an exposure to different aspects of Hindi language and literature, and also acquaint them with the literature and culture of Jharkhand.

Semester II

Paper	Objectives
CC3 (Hindi SahityakaItihaas: Reetikaal)	To enable the students to have A comprehensive knowledge of the history of Hindi literature, especially that of Reetikaal. The students shall be able to place literary works against socio-cultural and literary trends and contexts.
CC4 (Hindi SahityakaItihaas: Aadhunikkaal)	To enable the students to acquire a holistic understanding of Hindi language and literature in general and that of the modern era in particular.
G.E. II	To introduce the students of various disciplines to the use and study of Hindi in

various walks of social and professional life.

Semester III

Paper	Objectives
CC5 (Aadhunik Hindi Kavita)	To develop critical thinking among students by enabling a deep study of modern Hindi poetry and the emergence and the literary sensibilities of Hindi Romantic poets.
CC6 (Hindi Katha Saahitya)	To help students inculcate the skill of processing and analysing literary outputs and learning the technique of creative writing by studying the stories of eminent story-writers, thereby improving their style, pace and flow of writing.
CC7 (Hindi Nibandhaur Anya GadyaVidhaayen)	To develop among the student a positive outlook towards and a sense of pride for Hindi by exposing them to an in-depth study of various forms and genres of Hindi prose-writing.
SEC I	This paper aims at giving ample opportunities to enhance the skill in and among students of writing for media, screenplay writing and creative writing, and also teaching them the basics of the various aspects of the theatre and also the study and practice of translation and interpretation from English to Hindi and vice versa.
G.E. III	The purpose of this paper is to enable students from varied disciplines an exposure to different aspects of Hindi language and literature, and also acquaint them with the literature and culture of Jharkhand.

Semester IV

Paper	Objectives
CC8 (Prayojanmoolak Hindi)	To familiarise the students with the use and relevance of Hindi as a tool in different walks of life in India and also at the global level. This paper aims at teaching the functional and need-based aspects of the Hindi language in social, academic and professional fields.
CC9 (BhashaVigyaanaur Hindi Bhaasha)	To enable the students to have a holistic understanding of the basics of linguistics – the branches and history of linguistics, the evolution of language and its various aspects.
CC10 (Hindi NaatakaurRangmanch)	To enable an understanding of the social and artistic movements that have shaped theatre and dance and to familiarise the students with the various aspects of theatre, performance and direction.
SEC II	To familiarise the students with the importance and extensive use of Hindi in the world of audio-visual communication, advertisement and marketing.
G.E. IV	To introduce the students of various disciplines to the use and study of Hindi in various walks of social and professional life.

Semester V

Paper	Objectives
CC11 (BharatiyaKaavyashastra)	To help students acquire a broad understanding of the principles of Indian poetics and their application in the study and analysis of literature.
CC12 (PaashchaatyaKaavyashastra)	To enable an in-depth study of western poetics and theories and a deep understanding of the principles of literature as propounded by western scholars and philosophers, and thereby help students understand and analyse literature on the basis of these principles and perspectives.
DSE I	To make the students aware of the Indian cultural ethos by introducing them to the philosophies of Bhaktikaaleen poets like Kabir, Surdas, Tulsidas, and establish their relevance in the modern times.
DSE II	To help students study and understand the evolution of thought and language and its implication in the modern era. Eminent writers like Bharatendu and Romantic poets like Jaishankar Prasad have, with their works, moulded and influenced the modern times, and this course aims at making the students aware of the contribution of these writers in shaping Indian minds.

Semester VI

Paper	Objectives
CC13 (Hindi Aalochana)	To develop critical thinking among students. This paper is a survey of the evolution of Hindi literary criticism, its types and trends and the major figures associated.
CC14 (AsmitamoolakVimarsh)	The different discourses prescribed in this course shall enable the students to reflect upon the portrayal of the various sections of the society in literature. As literature is largely a reflection of life and the times, this course shall lead students to critically evaluate who we are, how we have evolved and where we stand as citizens, as individuals and as a society.
DSE III (Hindi BhashakaItihaas)	This course enables a holistic understanding of language and literature. It helps the students understand the evolution of the Hindi language and its script and establish a harmonised connection between the traditional and the modern ideas of language in general and the Hindi language in particular.
DSE IV	To develop and widen the critical thinking of students by engaging them in an in-depth study of the works and the contribution of the renowned literary critic, Ramchandra Shukla.

POLITICAL SCIENCE HONOURS

In the YSNM college, the following subjects are taught under the CBCS syllabus of Political Science prescribed by the NPU University.

The CBSE syllabus consists of 18 papers at the Undergraduate level.The following papers are taught under graduation:

Semester1 :C -1 An introduction to Political theory, C-2 Indian political thought, Semester 2 :C- 3 Indian National movement and constitutional development , C - 4 Indian Government and politics , Semester 3 : C - 5 local self government in India ,C - 6 comparative government and politics, C -7 ancient and medieval western political thought , Semester 4: C -8 theories of international politics , C - 9 modern Western political thought,C -10 public administration , Semester 5:C - 11 bureaucracy,C - 12 comparative politics political analysis , Semester 6: C- 13 political ideology,C -14 contemporary issues in Indian politics.

Apart from honours papers, students are also taught Discipline Specific Elective (Honours Specific), General Elective and Skill Enhancement Courses. Like - foreign policy of India, international organisation, federalism in India, Gandhian thought, an introduction to Political theory, Indian Government and politics , comparative government and politics, public administration, reading hind Swaraj by Mahatma Gandhi, basic computer knowledge etc.

The **Postgraduate Course** also includes a number of papers called CC - Core Courses.There are 4 semesters in it and there are four CC papers in each semester.It includes the following papers: foundation course, Political theory Western political thought, Indian political thought ,academic writing and communication skill ,theories of international politics, India and the world (Post cold war era), Indian Government and politics, research methodology, political sociology, public administration state politics in Jharkhand, international organisation, international law, contemporary political issues, &Dissertation.

The outcomes of the CBCS syllabus of Political Science at Nilamber Pitambar - University (NPU)

Understanding Political Science: Students will be able to understand the basics of political science, including politics, political theory, and political systems.

Understanding of governance: Studying public administration, political science, and international relations helps students comprehend how governments function, make decisions, and implement policies.

Critical Thinking and Analysis: Students will develop critical thinking and analysis skills, which will enable them to evaluate political issues, concepts, and theories.

Research Skills: Students will learn how to conduct research in political science, including data collection, analysis, and interpretationand develop solutions to real-world political problems.

Global perspectives: Studying international politics and relations broadens students' understanding of global issues, cultures, and diplomacy.

Communication Skills: Students will develop effective communication skills, both written and verbal, which will enable them to express their ideas and arguments clearly and persuasively.

Specialization: Students will have the opportunity to specialize in a particular area of political science, such as international relations, comparative politics, or political theory.

Career Opportunities: The CBCS syllabus in Political Science at NPU will prepare students for a range of career opportunities, including government, public policy, international relations,law, academia, journalism, and more.

Leadership and advocacy : Political science students develop leadership skills, learning to advocate for

social justice, human rights, and political change.
Generic Electives: Students will have the opportunity to take generic electives from other disciplines, which will broaden their understanding of political science and its relationship to other fields.
Discipline-Specific Electives: Students will have the opportunity to take discipline-specific electives, which will enable them to specialize in a particular area of political science.
Core Courses: Students will be required to take core courses in political science, which will provide them with a solid foundation in the discipline.
Credit-Based System: The CBCS syllabus at NPU is based on a credit-based system, which will allow students to earn credits for each course they complete. This will provide them with the flexibility to progress at their own pace and choose courses that interest them.

DEPARTMENT OF HOME SCIENCE
CBCS & NEP SYLLABUS

In the YSNM College, the following subjects are taught under the CBCS, NEP syllabus of Home Science prescribed by the NPU University.
The graduate Course also includes a number of papers & practical.
The outcomes of Home Science are numerous and diverse, impacting individuals, families, and communities. Some of the significant outcomes include:

1. Improved Nutrition and Health: Home Science helps individuals make informed decisions about food, nutrition, and health, leading to better overall well-being.

2. Effective Resource Management: Home Science teaches individuals to manage resources efficiently, reducing waste and promoting sustainability.

3. Enhanced Family Relationships: Home Science fosters healthy relationships within families, promoting communication, empathy, and understanding.

4. Child Development and Well-being: Home Science provides knowledge and skills to support optimal child development, ensuring children's physical, emotional, and psychological well-being.

5. Empowerment of Women: Home Science has historically played a significant role in empowering women, providing them with skills, knowledge, and confidence to take control of their lives.

6. Community Development: Home Science contributes to community development through outreach programs, education, and advocacy, promoting social change and improvement.

7. Personal Growth and Development: Home Science helps individuals develop important life skills, such as problem-solving, critical thinking, and time management.

8. Environmental Awareness and Sustainability: Home Science promotes environmental awareness, encouraging individuals to adopt sustainable practices and reduce their ecological footprint.

9. Food Security and Safety: Home Science teaches individuals to handle, store, and prepare food safely, reducing the risk of foodborne illnesses.

10. Economic Empowerment: Home Science provides individuals with skills and knowledge to manage

finances effectively, make informed consumer decisions, and develop entrepreneurial skills.
11. Fashion Design Concept: A tangible outcome is a well-designed, aesthetically pleasing garment or collection that showcases creativity and skill.
12. Introduction of textiles : The introduction of textiles had a profound impact on human civilization, driving technological, economic, social, and cultural advancements

These outcomes contribute to creating a better quality of life for individuals, families, and communities.

COURSE & PROGRAM OUTCOMES
OF PHILOSOPHY
HONOURS (B.A.)
UNDER CBCS

Course Outcomes

The syllabus of Philosophy honours comprises of 14 core courses , 2 SEC and 4 DSE papers.
S EM -1 and 2 , consists of Indian and Western Philosoph y. Indian Philosophy consists of nine diff et schools of Indian thoughts, both Āstika and NāstIka systems. Amongāstika schools there are Nyāya , Vaiśeṣika , Saṁkhya , Yo ga , Mimaṁsā and Vedānta. Ontheotherhand there are Cārvāka, J a inism and Budhhism as Nāstika schools .
The History of W estern philosophy consists of the epistemological and metaphys ical perspectives of the philosophers like Socrates, Plato, Descartes , Spinoza, Leibnitz , Locke , Berkeley, Hume and Kant.
SEM -3 consists of 3 core courses, that is Indian Ethics, Western Ethics and Meta-Ethics ,1 SEC , that is , Elementary Computer Application Softwares
Upon successful completion of the program, you should have the skills to:

- **Work effectively with a range of current, standard, Office Productivity software applications.**
- **Evaluate, select and use office productivity software appropriate to a given situation.**
- **Apply basic adult learning and assessment principles in the design, development, and presentation of material produced by office productivity applications.**
- **Demonstrate employability skills and a commitment to professionalism.**
- **Operate a variety of advanced spreadsheet, operating system and word processing functions.**
- **Solve a range of problems using office productivity applications, and adapt quickly to new software releases.**
- **Maintain quality assurance through critically evaluating procedures and results.**

.
Indian Ethics CC – 5
After successfully Completion of this Course Student will be able to …

- Ethics is a study of moral issues in the field of individual and collective interaction.
- The study of Ethics helps a student to gain the ability so that they can make themselves to become a proper social being.
- Student can be familiar with ethical values such as right and wrong, virtue or vice, good or bad.
- Student get acquainted with Indian moral concepts like Dharma,Adharma,Liberation,Purusharthas and their inter-relations, Niskama and Sakama Karma.
- Student will develop critical understanding about Indian Ethics. Indian Ethics consists of Ethics of Gita like Concept of Karmayoga,Buddhist Ethics like Pancasila, Brahmaviharabhavna, Jain Ethics like Anubrata,Mahabrata and also Mimansa Ethics like Nittya, Naimittika karma and Kamya karma.

Western Ethics CC – 6
After successfully Completion of this Course Student will be able to …

- Student will develop critical insight on this Western Ethics.
- Student can be familiar with ethical values such as right and wrong, virtue or vice, good or bad
- Western Ethics discusses about object of moral judgement and also about the Moral Theories of Plato and Aristotle.
- Western Ethics also consists of Standards of Morality like Hedonism, Deontological Ethic and also of Theories of Punishment.

Meta-Ethics CC- 7

After successfully Completion of this Course Student will be able to …

The truth, Goodness and Beauty of a theory result from its ability to explain, predict and control human behavior, which leads to satisfying outcomes for human being. Meta ethics can help us find out what the best outcome would be for society and how this can be made possible.

SEM -4 consists of 3 core courses, that is Indian Epistemology, Western Epistemology, Indian Metaphysics and SE C – 2, Deductive & Inductive Logic

Indian Epistemology CC – 8
Western Epistemology CC -9
Indian Metaphysics CC – 10

SEM -5 - consists of 2 core courses, that is Western Metaphysics, Social Philosophy and 2 DSE-1 Modern Indian Philosophy and DSE – 2 Symbolic Logic

Western Metaphysics CC- 11
Social Philosophy CC – 12
Modern Indian Philosophy DSE-1
Symbolic Logic DSE – 2

SEM -6

Consists of 2 core courses, that is Srimadbhagwad Gita (Capter 02-06) and Philosophy of Religion, 2 Discipline Specific Elective, DSE – 3 AND DSE - 4

Program Outcomes of Philosophy Honours

PO- 1- The study of Philosophy helps the students to get acquainted with different schools of Indian philosophy like Cārvāka, Jainism and Budhhism as Nāstika schools on the other hand, Sāṁkhya, Yoga, Nyāya, Vaiśeṣika, Mimāṁsā and Vedānta as Āstika school, on the other hand.

PO-2- They learn both Psychology and Social and Political philosophy. In the part of Psychology students become aware of different theories like Interactionism, Philosophical behaviourism, Person theory along with different methods of Psychology, nature and relation of sensation and perception. They become acquainted with theories of learning, different levels of mind, Freuds theory of dream. They also learn different tests of Intelligence regarding I.Q. measurement.

PO-3- In the part of Social and Political philosophy students of philosophy learn about the nature of social and political philosophy and their relation. They also study the basic concepts of society, nature and role of family in society, different theories regarding the relation between individual and society. They also learn about secularism, nature and progress of Social changes, different theories of social changes, discussion about different political ideals.

PO-4- Students get acquainted with the epistemological and metaphysical theories of the western philosophers like Socrates, Plato, Descartes, Spinoza, Leibnitz , Locke, Berkeley Hume and Kant.

PO-5- By studying Logic, students get acquainted with the use of logical rules for identifying a valid argument. Along with these, they also learn existential import, symbolic interpretation, constructing formal proof of .validity, proving invalidity, Quantification theory. Study of this paper helps them to be aware of Mill's different experimental methods, Science and Hypothesis and also different theories of probability.

Program Specific Outcomes of Philosophy Honours

PSO 1- The study of Philosophy in general develops the faculty of understanding of the students. The study of Logic enriches one's thinking skill and sharpens one's analytical abilities. It equips students to grasp the different issues discussed in mathematics, computer science etc.

PSO 2- The study of Psychology gives the opportunity for the students to learn about brain states, different

personality traits, the sub-conscious and conscious reasons for human.
PSO 3- The study of Ethics helps a student to gain the ability so that they can make themselves to become a proper social being. The Honours course enables the students to develop an insight into the intricacies of the subject and prepare them for more advanced courses on subject in the university of Calcutta as well as in the other universities both national and international. It also develops in them to think logically and essentially which is absolutely essential in realising the principles and theories of Philosophy.
PSO 4- Develops the ability to think logically, to analyse and solve problems, to assess proposed solutions, to write and speak clearly, attending to details
PSO 5- Brings the important questions to the table and works towards an answer. It encourages us to think critically about the world; it is the foundation of all knowledge and when utilised properly, can provide us with huge benefits.
PSO 6- Enhances in a way no other activity does, one's problem-solving capacities, contributes uniquely to the development of expressive and communicative powers, persuasive powers, writing skills
PSO 7- Moral Philosophy involves systematizing, defending and recommending concepts of right and wrong behaviour
PSO 8- It's the most practical by far because it teaches to think critically and evaluate arguments and truth claims
PSO 9- Improves reasoning and critical skills, teaches how to ask good questions from the worthless questions.

Course Outcomes of Philosophy Generic Elective

[For students having Honours in subjects other than Philosophy]

Semester I - Generic Elective Course I (GE-I)

PHI-G-CC-1 Indian Philosophy (Part - 1)

Student get an in depth understanding about-

• Cārvāka Epistemology,Metaphysics, Ethics
• Jainism Metaphysics
• Buddhism, Metaphysics

Semester II - Elective Course II (GE-II)

PHI –G –II Indian Philosophy (Part – 1I)

- Nyaya Pramana
- Vaisheshika – Padartha
- Samkhya – Caousation, Vikasvada, Prakriti, Purusha
- Yoga – Ashtanga- yoga
- Mimansa – Theory of Karma
- Shankaracharya – Nirguna Brahman, Jagat
- Ramanujacharya – Refytation of Mayavada, Sagu Brahman

Semester III - Generic Elective Course III (GE-III)

Indian Ethics

- **Upanisadas – Law of Karma and Salvation**
- **Purashartha**
- **Ethics of Bhagvadgita**
- **Jain Ethics**
- **Buddhist Ethic**
- **Dharma**

Semester IV Generic Elective Course IV (GE-IV)

PHI-G Western Ethics

Department of Computer Science

Vision

- To be a department of academic excellence dedicated to providing high-quality education in computer science and associated subjects, with a comprehensive focus on improving people's lives, society, and environment.
- To educate and train the next generation of high-quality information technology professionals to meet the industry's needs.

Mission

- To prepare students to be successful, ethical, and effective problem solvers as well as life-long learners who will positively contribute to the nation's economic well-being.
- To deliver high-quality education in order to meet the demands of the profession and society.
- To create a professional learning environment in which students can develop innovative and problem-solving skills.
- To improve the Industry Institute Interaction programme in order to become more familiar with the corporate culture.
- To equip students with the skills they'll need to succeed in today's fast-paced technology environment.
- To encourage the development of computer-related abilities that may be applied immediately to other areas of the curriculum.
- To assist students in the development and application of problem-solving abilities.

COMPUTER APPLICATION HONOURS

Vision

Through its quality teaching, the department of B.Sc.(Computer Application) strives to establish an intellectual environment that supports the search for new information in a rapidly dynamic computer world.

Mission

The B.Sc. (Computer Application) focuses on comprehensive, interdisciplinary computer application training, allowing students to understand and implement new advances as the area evolves.

Program Specific Outcomes

PSO 1 : Understand the fundamentals of digital fundamentals, object-oriented programming concepts, databases, microprocessor and assembly languages, and web and other applications.

PSO 2 : With the help of a visual programming environment, learn standard software engineering and project management techniques in software development.

PSO 3 : Demonstrate a comprehension of the software aspects of computer systems, including their values and how they work.

PSO 4 : Acquire the ability to plan and develop computer programmes, assess and identify potential dangers, and offer pioneering solutions.

PSO 5 : Discover technical knowledge in a variety of Computer Applications fields, as well as an atmosphere that aids in the development of skills for a successful career.

PSO 6 :Acquire expertise in generating successful pioneering solutions for real-world business and business development difficulties, with a desire for quality, capability, and a comprehensive approach.

PSO 7 : Attain the ability to integrate new technologies and regularly upgrade their abilities while maintaining an attitude of self-directed learning.

Course Outcomes :

Semester – I

Core Paper C-I (A) :PROGRAMMING USING C/C++

The course is meant to provide a thorough understanding of the C/C++ programming language. Students will be able to design logics that will aid them in creating C/C++ programmes and applications. They will be able to quickly switch to any other programme in the future if they master the basic programming constructs of C/C++.

Core Paper C-I (B) :PROGRAMMING USING C/C++ LAB

The course is meant to give students hands-on experience with the C/C++ programming language. They will create programmes and apps utilizing basic programming structures.

Core Paper C-II : DISCRETE STRUCTURE

The goal of the course is to make students to able to explain and use discrete mathematics approaches in Computer Science. It will also assist students in reasoning logically about various data types and structures utilized in computer algorithms and systems, such as numbers, sets, graphs, and trees. Students will also be able to use analytic approaches to model and analyze computational processes.

Semester – II

Core Paper C-III (A) : PROGRAMMING USING JAVA

This course covers the fundamentals of Object-Oriented Programming in Java. Students should understand the many models of object-oriented programming, such as abstract data types, inheritance, encapsulation, and polymorphism, by the end of the course.

Core Paper C-III (B) : PROGRAMMING USING JAVA LAB

This course gives you hands-on experience with Java Object Oriented Programming. Students will be able to create applications that incorporate abstract data types, inheritance, encapsulation, and polymorphism, among other concepts.

Core Paper C-IV (A) : PROGRAMMING USING DATA STRUCTURE

To determine the impact of data structures and algorithm design methodologies on programme performance. It will aid in the solution of problems involving data structures like as linear lists, stacks, queues, binary trees, graphs, and so on, as well as the creation of programmes to implement these solutions.

Core Paper C-IV (B) : PROGRAMMING USING DATA STRUCTURE LAB

The goal of this course is to provide students hands-on experience with data structures including linear lists, stacks, queues, binary trees, and graphs to solve issues.

Semester – III

Core Paper C-V (A) : COMPUTER SYSTEM ARCHITECTURE

The goal of this course is to teach students about the hardware, logic, fundamental structure, and behaviour of the many functional components of a computer, as well as how they interact to meet the user's processing demands.

Core Paper C-V (B) : COMPUTER SYSTEM ARCHITECTURE LAB

The goal of the course is to teach students about the computer instructions and mnemonics used in computer architecture, and then to use C to create programmes that replicate various machines utilizing the computer instructions (Memory Reference, Register Reference, and Input/Output Instructions).

Core Paper C-VI (A) : OPERATING SYSTEM

Process control, threads, concurrency, memory management scheduling, I/O files, distributed systems, and security are among the topics covered in this course. It will assist in determining whether a computer-based system, process, component, or application meets the desired requirements.

Core Paper C-VI (B) : OPERATING SYSTEM LAB

The objective of this course is to provide students with hands-on experience with process control, threads, concurrency, memory management scheduling, I/O files, distributed systems, and security.

Core Paper C-VII (A) : COMPUTER NETWORKS

The objective of this course is to assist students get a theoretical grasp of data communication and computer networks as well as practical experience with installation, monitoring, and troubleshooting.

Core Paper C-VII (B) : COMPUTER NETWORKS LAB

The objective of this course is to familiarize students with basic network administration commands, as well as to help them comprehend the network environment, visualize a network topology, and evaluate its performance. They'll also learn how to assess traffic flow and protocol frame contents, as well as design and configure a network for an enterprise.

Skill Enhancement Course SEC-I : HTML

The objective of this course is to acquaint the students with client-server architecture and to teach them how to develop and analyze web pages, as well as identify its elements and features.

Semester – IV

Core Paper C-VIII (A) : DESIGN AND ANALYSIS OF ALGORITHM

The objective of this course is to demonstrate innovative and efficient problem-solving techniques using various problem-solving models. To tackle a variety of problems, numerous algorithms will be designed and analyzed.

Core Paper C-VIII (B) : DESGIN AND ANALYSIS OF ALGORITHM LAB

The objective of this course is to teach students how to design and implement various data structure operations such as searching, insertion, and deletion, as well as traversing mechanisms.

Core Paper C-IX (A) :SOFTWARE ENGINEERING

The objective of this course is to assist students in developing skills that will enable them to generate high-quality software that is easy to understand, alter, and maintain.

Core Paper C-IX (B) :SOFTWARE ENGINEERING LAB

The purpose of this course is to educate basic UML principles, as well as to master the UML's vocabulary, conventions, and idioms, and to learn how to model it efficiently. Students will also be able to use the UML to tackle a variety of modelling challenges.

Core Paper C-X (A) : DATABASE MANAGEMENT SYSTEM

The purpose of this course is to teach students about the importance of a database management system in an organisation. It will also assist them in comprehending essential database principles, such as the relational data model's structure and operation.

Core Paper C-X (B) : DATABASE MANAGEMENT SYSTEM LAB

The objective of this course is to teach students how to use Structured Query Language(SQL) to create both simple and complicated database queries. It will teach students how to use SQL in stored procedures, functions, packages, and triggers to retrieve, update, and display data.

Skill Enhancement Course SEC-II : PL/SQL

The course objective is make students able to develop both simple and advanced database queries using Structured Query Language (SQL). It will help the students to retrieve, update and display data using SQL integrated into stored procedures, Functions, Packages and Triggers.

Semester – V

Core Paper C-XI (A) : INTERNET TECHNOLOGIES

The purpose of this course is to teach the fundamentals of publishing information on the Internet. The student will be familiar with client-server architecture and will be able to create a web application using Java. Students will receive the necessary skills and project-based experience to pursue professions in web application and development.

Core Paper C-XI (B) : INTERNET TECHNOLOGIES LAB

The purpose of this course is to give students hands-on experience in order for them to gain knowledge and abilities in the building of web sites from both the client and server perspectives. Students will learn how to write Javascript code and will also be introduced to JSP and JDBC.

Core Paper C-XII (A) : ARTIFICIAL INTELLIGENCE

The objective of this course is to give students an overview of Artificial Intelligence techniques and principles. It will also aid in the development of an understanding of the AI building blocks as they are presented in terms of intelligent agents, such as search, knowledge representation, inference, logic, and learning.

Core Paper C-XII (B) : ARTIFICIAL INTELLIGENCE LAB

The objective of this course is to familiarize students with PROLOG programming and to assist them in developing and executing programming utilizing PROLOG's numerous constructions and logics.

Discipline Specific Elective DSE-I (A) : WINDOWS PROGRAMMING USING VISUAL BASIC.NET

The objective of this course is to teach students how to utilize Visual Basic.Net to create Windows applications that leverage structured and object-based programming techniques. Students will be able to assess programme requirements, create programmes with graphical user interfaces, and test existing code in order to improve it.

Discipline Specific Elective DSE-I (B) : WINDOWS PROGRAMMING USING VISUAL BASIC.NET LAB

The purpose of this course is to provide students with practical experience with Visual Basic.Net. Students will use structured and object-based programming techniques to create Windows applications.

Discipline Specific Elective DSE-II (A): OPERATION RESEARCH

The course's objective is to teach students how to use the fundamentals of operations research to solve problems using a mathematical approach to decision making. It will assist students in using numerical tools and approaches for making decisions, constructing models, and applying them to business decision issues.

Discipline Specific Elective DSE-II (B): OPERATION RESEARCH LAB

The objective of this course is to prepare students for a variety of operations research challenges, such as solving a linear programming problem utilizing the graphical technique, branch and bound method, simplex method, dual simplex method, M-charnes method, Two phase method, and so on.

Semester – VI

Core Paper C-XIII : THEORY OF COMPUTATION

The objective of this course is to develop a mathematical view of algorithmic design and computation by establishing a correct relationship between algorithmic problem solving and the theory of languages and automata.

Core Paper C-XIV (A) : COMPUTER GRAPHICS

The objective of this course is to provide students with hands-on experience with interactive computer graphics and the use of a graphics application programming interface. In this course, students will learn about all aspects of computer graphics, including hardware, software, and applications.

Core Paper C-XIV (B) : COMPUTER GRAPHICS LAB

The objective of this course is to provide practical exposure to students on computer graphics by teaching them how to build and implement algorithms like Bresenham's Line Drawing, Mid-Point Circle Drawing, Cohen and Sutherland line clipping, scan line fill, and so on.

Discipline Specific Elective DSE-III (A): ECOMMERCE AND PHP PROGRAMMING

The objective of Ecommerce is to teach students about the impact of electronic commerce on businesses, governments, and consumers. It will also provide an awareness of the many types of business models and their major components in the new economy. PHP programming will provide with the skills you'll need to create dynamic, database-driven web pages. Students will be introduced to PHP's foundation and syntax, as well as key strategies for creating dynamic web sites.

Discipline Specific Elective DSE-III (B): ECOMMERCE AND PHP PROGRAMMING LAB

The objective of this course is to acquaint the students with the various components and logics of PHP programming and to assist them in developing simple PHP programmes.

Discipline Specific Elective DSE-IV : DISSERTATION/PROJECT

The objective of the dissertation/project is for the student to get a deeper understanding, knowledge, and capabilities in the context of the programme of study by exposing them to practical situations. It will also allow students to conduct in-depth research in an area of interest while also allowing them to demonstrate skills and knowledge gained throughout their undergraduate programme.

INFORMATION TECHNOLOGY HONOURS

Vision

The B.Sc.(Information Technology) department aspires to develop prominent graduates who are well-versed in the latest technologies and tools, as well as exceptional professionals in the field of computer science to serve industry and society.

Mission

The objective of the B.Sc.(Information Technology) programme is to deliver high-quality education that is associated with industry needs and to provide technical knowledge through a well-organized teaching-learning process.

Program Specific Outcomes

PSO 1 : Programming, multimedia, animation, web development, networking, and domain-based electives are among the skills that have been acquired.

PSO 2 : Understand and apply modern computer languages and applications to build platforms for a successful profession and further education.

PSO 3 : Develop skills in areas such as information technology and its enabled services, government and private sector, research, and teaching.

PSO 4 : Understand and be able to design, develop, and provide software solutions to meet the needs of industry.

PSO 5 : Use the most up-to-date approaches, skills, and tools for computing.

PSO 6 : Build software systems in groups and apply the technologies to a variety of computer-related challenges, such as hardware issues, web site development, databases, and other software engineering methodologies.

Course Outcomes :

Semester – I

Core Paper C-I (A) :PROGRAMMING USING C/C++

The course is meant to provide a thorough understanding of the C/C++ programming language. Students will be able to design logics that will aid them in creating C/C++ programmes and applications. They will be able to quickly switch to any other programme in the future if they master the basic programming constructs of C/C++.

Core Paper C-I (B) :PROGRAMMING USING C/C++ LAB

The course is meant to give students hands-on experience with the C/C++ programming language. They will create programmes and apps utilizing basic programming structures.

Core Paper C-II : DISCRETE STRUCTURE

The goal of the course is to make students to able to explain and use discrete mathematics approaches in Computer Science. It will also assist students in reasoning logically about various data types and structures utilized in computer algorithms and systems, such as numbers, sets, graphs, and trees. Students will also be able to use analytic approaches to model and analyze computational processes.

Semester – II

Core Paper C-III (A) : PROGRAMMING USING JAVA

This course covers the fundamentals of Object-Oriented Programming in Java. Students should understand the many models of object-oriented programming, such as abstract data types, inheritance, encapsulation, and polymorphism, by the end of the course.

Core Paper C-III (B) : PROGRAMMING USING JAVA LAB

This course gives you hands-on experience with Java Object Oriented Programming. Students will be able to create applications that incorporate abstract data types, inheritance, encapsulation, and polymorphism, among other concepts.

Core Paper C-IV (A) : PROGRAMMING USING DATA STRUCTURE

To determine the impact of data structures and algorithm design methodologies on programme performance. It will aid in the solution of problems involving data structures like as linear lists, stacks, queues, binary trees, graphs, and so on, as well as the creation of programmes to implement these solutions.

Core Paper C-IV (B) : PROGRAMMING USING DATA STRUCTURE LAB

The goal of this course is to provide students hands-on experience with data structures including linear lists, stacks, queues, binary trees, and graphs to solve issues.

Semester – III

Core Paper C-V (A) : COMPUTER SYSTEM ARCHITECTURE

The goal of this course is to teach students about the hardware, logic, fundamental structure, and behaviour of the many functional components of a computer, as well as how they interact to meet the user's processing demands.

Core Paper C-V (B) : COMPUTER SYSTEM ARCHITECTURE LAB

The goal of the course is to teach students about the computer instructions and mnemonics used in computer architecture, and then to use C to create programmes that replicate various machines utilizing the computer instructions (Memory Reference, Register Reference, and Input/Output Instructions).

Core Paper C-VI (A) : OPERATING SYSTEM

Process control, threads, concurrency, memory management scheduling, I/O files, distributed systems, and security are among the topics covered in this course. It will assist in determining whether a computer-based system, process, component, or application meets the desired requirements.

Core Paper C-VI (B) : OPERATING SYSTEM LAB

The objective of this course is to provide students with hands-on experience with process control, threads, concurrency, memory management scheduling, I/O files, distributed systems, and security.

Core Paper C-VII (A) : COMPUTER NETWORKS

The objective of this course is to assist students get a theoretical grasp of data communication and computer networks as well as practical experience with installation, monitoring, and troubleshooting.

Core Paper C-VII (B) : COMPUTER NETWORKS LAB

The objective of this course is to familiarize students with basic network administration commands, as well as to help them comprehend the network environment, visualize a network topology, and evaluate its performance. They'll also learn how to assess traffic flow and protocol frame contents, as well as design and configure a network for an enterprise.

Skill Enhancement Course SEC-I : HTML

The objective of this course is to acquaint the students with client-server architecture and to teach them how to develop and analyze web pages, as well as identify its elements and features.

Semester – IV

Core Paper C-VIII (A) : DESIGN AND ANALYSIS OF ALGORITHM

The objective of this course is to demonstrate innovative and efficient problem-solving techniques using various problem-solving models. To tackle a variety of problems, numerous algorithms will be designed and analyzed.

Core Paper C-VIII (B) : DESGIN AND ANALYSIS OF ALGORITHM LAB

The objective of this course is to teach students how to design and implement various data structure operations such as searching, insertion, and deletion, as well as traversing mechanisms.

Core Paper C-IX (A) :SOFTWARE ENGINEERING

The objective of this course is to assist students in developing skills that will enable them to generate high-quality software that is easy to understand, alter, and maintain.

Core Paper C-IX (B) :SOFTWARE ENGINEERING LAB

The purpose of this course is to educate basic UML principles, as well as to master the UML's vocabulary, conventions, and idioms, and to learn how to model it efficiently. Students will also be able to use the UML to tackle a variety of modelling challenges.

Core Paper C-X (A) : DATABASE MANAGEMENT SYSTEM

The purpose of this course is to teach students about the importance of a database management system in an organisation. It will also assist them in comprehending essential database principles, such as the relational data model's structure and operation.

Core Paper C-X (B) : DATABASE MANAGEMENT SYSTEM LAB

The objective of this course is to teach students how to use Structured Query Language (SQL) to create both simple and complicated database queries. It will teach students how to use SQL in stored procedures, functions, packages, and triggers to retrieve, update, and display data.

Skill Enhancement Course SEC-II : XML

The objective of this course is to make students gain practical expertise with XML, schemas, XSLT, and XML publishing through understanding the evolution, theoretical context, and application of XML. The course also teaches students how to recognize the relationship between XML and metadata, as well as how to use XML in a broader context on the internet.

Semester – V

Core Paper C-XI (A) : INTERNET TECHNOLOGIES

The course objective is to teach the basics involved in publishing content on the World Wide Web. The student will be acquainted with the client server architecture and able to develop a web application using java technologies. Students will be able to gain the skills and project based experience needed for entry into web application and development careers.

Core Paper C-XI (B) : INTERNET TECHNOLOGIES LAB

The course objective is to provide practical exposure to the students to acquire knowledge and skills for creation of web site considering both client and server side. The students will know how to develop javascript codes and will also learn about JSP and JDBC.

Core Paper C-XII (A) : ARTIFICIAL INTELLIGENCE

The course objective is to help the student to have an overview of Artificial Intelligence approaches and principles. It will also assist in developing the understanding of the building blocks of AI as presented in terms of intelligent agent ie. search, knowledge representation, inference , logic and learning.

Core Paper C-XII (B) : ARTIFICIAL INTELLIGENCE LAB

The course objective is to make the students aware about PROLOG programming and help them to develop and execute programming using various constructs and logics of PROLOG programming.

Discipline Specific Elective DSE-I (A) : WINDOWS PROGRAMMING USING VISUAL BASIC.NET

The course objective is to help the students use Visual Basic.Net to build Windows Applications using structured and object-based programming techniques. Students will be able to analyze program requirements, develop programs with GUI interfaces and perform tests to revise existing code.

Discipline Specific Elective DSE-I (B) : WINDOWS PROGRAMMING USING VISUAL BASIC.NET LAB

The course objective is to help the students to have practical exposure on Visual Basic.Net. The students will build Windows Applications using structured and object-based programming techniques.

Discipline Specific Elective DSE-II (A): OPERATION RESEARCH

The objective of the course is to make the students use the basic tolls of Operations Research in solving the problems using mathematical approach for decision making. It will help the students to use numerical methods and techniques for decision making, formulating the model and applications that are used in solving business decision problems.

Discipline Specific Elective DSE-II (B): OPERATION RESEARCH LAB

The course objective is to prepare the students for various operation research problems such as solving a linear programming problem using graphical method, branch and bound method, simplex method, dual simplex method, M-charnes method, Two phase method, etc.

Semester – VI

Core Paper C-XI (A) : INTERNET TECHNOLOGIES

The purpose of this course is to teach the fundamentals of publishing information on the Internet. The student will be familiar with client-server architecture and will be able to create a web application using Java. Students will receive the necessary skills and project-based experience to pursue professions in web application and development.

Core Paper C-XI (B) : INTERNET TECHNOLOGIES LAB

The purpose of this course is to give students hands-on experience in order for them to gain knowledge and abilities in the building of web sites from both the client and server perspectives. Students will learn how to write Javascript code and will also be introduced to JSP and JDBC.

Core Paper C-XII (A) : ARTIFICIAL INTELLIGENCE

The objective of this course is to give students an overview of Artificial Intelligence techniques and principles. It will also aid in the development of an understanding of the AI building blocks as they are presented in terms of intelligent agents, such as search, knowledge representation, inference, logic, and learning.

Core Paper C-XII (B) : ARTIFICIAL INTELLIGENCE LAB

The objective of this course is to familiarize students with PROLOG programming and to assist them in developing and executing programming utilizing PROLOG's numerous constructions and logics.

Discipline Specific Elective DSE-I (A) : WINDOWS PROGRAMMING USING VISUAL BASIC.NET

The objective of this course is to teach students how to utilize Visual Basic.Net to create Windows applications that leverage structured and object-based programming techniques. Students will be able to assess programme requirements, create programmes with graphical user interfaces, and test existing code in order to improve it.

Discipline Specific Elective DSE-I (B) : WINDOWS PROGRAMMING USING VISUAL BASIC.NET LAB

The purpose of this course is to provide students with practical experience with Visual Basic.Net. Students will use structured and object-based programming techniques to create Windows applications.

Discipline Specific Elective DSE-II (A): OPERATION RESEARCH

The course's objective is to teach students how to use the fundamentals of operations research to solve problems using a mathematical approach to decision making. It will assist students in using numerical tools and approaches for making decisions, constructing models, and applying them to business decision issues.

Discipline Specific Elective DSE-II (B): OPERATION RESEARCH LAB

The objective of this course is to prepare students for a variety of operations research challenges, such as solving a linear programming problem utilizing the graphical technique, branch and bound method, simplex method, dual simplex method, M-charnes method, Two phase method, and so on.

Semester – VI

Core Paper C-XIII : THEORY OF COMPUTATION

The objective of this course is to develop a mathematical view of algorithmic design and computation by establishing a correct relationship between algorithmic problem solving and the theory of languages and automata.

Core Paper C-XIV (A) : COMPUTER GRAPHICS

The objective of this course is to provide students with hands-on experience with interactive computer graphics and the use of a graphics application programming interface. In this course, students will learn about all aspects of computer graphics, including hardware, software, and applications.

Core Paper C-XIV (B) : COMPUTER GRAPHICS LAB

The objective of this course is to provide practical exposure to students on computer graphics by teaching them how to build and implement algorithms like Bresenham's Line Drawing, Mid-Point Circle Drawing, Cohen and Sutherland line clipping, scan line fill, and so on.

Discipline Specific Elective DSE-III (A): ECOMMERCE AND PHP PROGRAMMING

The objective of Ecommerce is to teach students about the impact of electronic commerce on businesses, governments, and consumers. It will also provide an awareness of the many types of business models and their major components in the new economy. PHP programming will provide with the skills you'll need to create dynamic, database-driven web pages. Students will be introduced to PHP's foundation and syntax, as well as key strategies for creating dynamic web sites.

Discipline Specific Elective DSE-III (B): ECOMMERCE AND PHP PROGRAMMING LAB

The objective of this course is to acquaint the students with the various components and logics of PHP programming and to assist them in developing simple PHP programmes.

Discipline Specific Elective DSE-IV : DISSERTATION/PROJECT

The objective of the dissertation/project is for the student to get a deeper understanding, knowledge, and capabilities in the context of the programme of study by exposing them to practical situations. It will also allow students to conduct in-depth research in an area of interest while also allowing them to demonstrate skills and knowledge gained throughout their undergraduate programme.

MA Political Science

Students will:

- Develop their understanding of our political system and its basic political concepts.
- understand and interpret the political challenges faced and be able to provide solutions to contemporary challenges being faced.
- develop general understanding of political ideas concepts and theories both at national and international level.
- develop understanding on issues of international and domestic politics and public policy.
- demonstrate critical thinkingabout key issues of public policy and politics.
- demonstrate competency with basic tools underlying modern social science research including competency in statistics and qualitative analysis.

COURSE CODE	COURSE TITLE	COURSE OBJECTIVE
POLCC101	**WESTERN POLITICAL THEORY**	• To introduce students with the idea of political theory, its history, and approaches. • To focus on the nature and significance of political theory as it evolved and analyses its contemporary relevance. • To indicates the need to incorporate new perspectives that have arisen in the recent past. **Learning Outcome:** • Students will be able to develop understanding about the Nature and significance of political theory.
POLCC102	**COMPARATIVE GOVERNMENTS WITH SPECIAL REFERENCE TO BRITANN,AMERICA,FRANCE, AND SWITZERLAND**	• To focus on examining politics in a historical framework while engaging with various themes of comparative analysis in developed and developing countries. • To understand the key features of major constitutions of the world. **Learning Outcome** • The students will be able to understand and apply different approaches to explain the functioning of different types of governing regimes. • They will be able to compare democratic regimes and evaluate their functioning. • They will be able to critically reflect on critical aspects of electoral democracy that includes functioning of parties and the relation between representation and democracy.
POLCC103	**STATE POLITICS IN INDIA**	• to understand the changing power structure of the centre-state relations within the quasi-federal framework of India strengthening state within the liberalization paradigm offers an interesting study. **Learning Outcome** • Student will be able to critically reflect on critical aspects of centre state relations. • They will be able to understand the nature Indian federalism and regional politics that includes functioning of parties and the relation between representation and democracy.

POLC C104	**INDIAN FOREIGN POLICY**	• To understand the internal and internal determinants of Indian foreign policy and its evolution since independence **Learning Outcome** • Students will be able to understand about the principles and determinants of India‘s Foreign policy and Post-cold war relations with various regions.
POLC C205	**HUMAN RIGHTS**	• To sensitize and inform the students about our human rights, its violations and redressal. **Learning Outcome** • The student will be able to explain the meaning of human rights and examine human rights issues in different social, political, and cultural contexts. • The students will be able to relate human rights with other rights of individuals. • They will come to know how ideologies which seek to create hegemony; religious or political, pose threats to the human rights of individuals.
POLC C206	**SOCIAL AND POLITICAL MOVEMENTS IN INDIA**	• To understand the nature of Political mobilization and different types of popular movements in India. **Learning Outcome** • This paper makes the student aware of the accommodative nature of Indian democracy. • This paper also provides knowledge of the changing nature of these movements with a focus on new social movements dealing with environmental and human rights issues.
POLC C207	**PUBLIC POLICY IN INDIA**	• to familiarize students with the broder theoretical, financial and practical contents in which public policies are discussed, justified, designed and sought to be implemented. **Learning Outcome** • Students can learn how policies are formulated and the various practical issues that are faced during its implementation.
POLC C208	**SOUTH ASIA IN**	• to present an analytical perspective on societal dynamics and their impact on political processes in South Asia.

	INTERNATIONAL POLITICS	• To study the institutions, processes, problems, and solutions than pertain to the South Asian region. **Learning Outcome** • This paper focuses on the political economy, social history of South Asia as a whole as well as on the variant forms of government –democratic and authoritarian- of its member nations.
POLC C309	**ADMINISTRATIVE THEORY**	• To focus on the theories that have shaped the emergence of modern systems of governance and their related structures and processes including western and non-western tradition. **Learning Outcome** • The coursed has a clear normative thrust to evolve pre requisites for promoting effective and just administration at the local and national levels.
POLC C310	**E-GOVERNANCE**	• to provide students insightful exposure in this emerging trend in governance so that they are able to appreciate the phenomenon and the process in an efficient way. **Learning Outcome** • Expansion of ICT is redefining relationships among various stakeholders in the process of governance. E-Governance is as emerging trend to re-invent governance, enhance good governance.
POLC C311	**POLITICAL PROCESS IN INDIA**	• to study the interaction between political processes and the constitutional structure in detail. **Learning Outcome** • student will be able to get an insight into different aspects of the political process in India, the basic nature and actual functioning of the system as a whole.

POLC C312	**GENDER POLITICS**	• to introduce the student to the various perspectives of the concept of gender. **Learning Outcome** • The students will be able to understand how the politics of gender is influencing the policy making process today.
POLC C413	**INDIAN ADMINISTRATION**	• to study public administration in its larger systematic milieu, i.e. in the Indian context. The nitty-gritty of Indian administration and its foundations and remedies to face the emerging challenges **Learning Outcome** • Students can learn how policies are formulated and the various practical issues that are faced during its implementation.
POLC C414	**DALIT POLITICS**	• to discuss the nature of Dalit politics, and the challenges and dilemmas that they face in contemporary India. **Learning Outcome** • Students will be able to understand the nature of dalit movement in contemporary India. • Students will be able to understand the factors affecting voting behaviour and Voting pattern in India.
POLC C415	**RESEARCH METHODOLOGY AND PROJECT**	• To introduce students with the processes and methods of empirical research for achieving scientific knowledge in political science. • to teach the method of data collection, sample survey, preparation of bibliography and questionnaire, writing of report, dissertation and thesis. **Learning Outcome** • students will be able to develop their research skills, critical analysis, synthesis and evaluation of new and complex ideas.
POLC C416	**POLITICAL PROCESS IN JHARKHAND**	• to make student aware of the Jharkhand movement related with the formation of the state. **Learning Outcome** • student will be able to understand the political process of the state in detail, identifying various dependent and independent variables and their working at the state as well as local level.