COURSE OUTCOME 2025-26
DEPARTMENT OF MATHEMATICS

B.Sc. (Hons.) Mathematics

Sem	Type of Course	Course Name	Course Outcomes
I	Core	DSC-1: Algebra	CO1: Determine number of positive/negative real roots of a real polynomial. CO2: Solve cubic and quartic polynomial equations with special condition on roots and in general. CO3: Employ De-Moivre's theorem in a number of applications to solve numerical problems. CO4: Use modular arithmetic and basic properties of congruences. CO5: Recognize the algebraic structure, namely groups, and classify subgroups of cyclic groups.
I	Core	DSC-2: Elementary Real Analysis	CO1: Understand the fundamental properties of the real numbers, including completeness and Archimedean, and density property of rational numbers in $\mathbb{R}$. CO2: Learn to define sequences in terms of functions from $\mathbb{N}$ to a subset of $\mathbb{R}$ and find the limit. CO3: Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate the limit superior and limit inferior of a bounded sequence. CO4: Apply limit comparison, ratio, root, and alternating series tests for convergence and absolute convergence of infinite series of real numbers.
I	Core	DSC-3: Probability and Statistics	CO1: Understand some basic concepts and terminology - population, sample, descriptive and inferential statistics including stem-and-leaf plots, dot plots, histograms and boxplots. CO2: Learn about probability density functions and various univariate distributions such as binomial, hypergeometric, negative binomial, Poisson, normal, exponential and lognormal. CO3: Understand the remarkable fact that the empirical frequencies of so many natural populations, exhibit bell-shaped (i.e., normal) curves, using the Central Limit Theorem. CO4: Measure the scale of association between two variables, and to establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.
I	SEC	SEC-1: IT Skills and Data Analysis - I	CO1: Represent and interpret data in tabular and graphical forms CO2: Understand and interpret the measures of central tendency and dispersion. CO3: Use IT tools such as spreadsheets to visualize and analyze data.

I	VAC	VAC-1: Vedic Mathematics-1	CO1: Overcome the fear of mathematics CO2: Improved critical thinking CO3: Familiarity with the mathematical underpinnings and techniques CO4: Ability to do basic mathematics faster and with ease. CO5: Appreciate the Mathematical advancements of Ancient India.
I	VAC	Digital Empowerment	The Learning Outcomes of this course are as follows: CO1: Use ICT and digital services in daily life. CO2: Develop skills to communicate and collaborate in cyberspace using social platforms, teaching/learning tools. CO3: Understand the significance of security and privacy in the digital world. CO4: Evaluate ethical issues in the cyber world
II	Core	DSC-4 Linear Algebra	CO1: Visualize the space $RRnn$ in terms of vectors and their interrelation with matrices. CO2: Familiarize with basic concepts in vector spaces, linear independence and span of vectors over a field. CO3: Learn about the concept of basis and dimension of a vector space. CO4: Basic concepts of linear transformations, dimension theorem, matrix representation of a linear transformation with application to computer graphics.
II	Core	DSC-5: Calculus	CO1: The notion of limits, continuity and uniform continuity of functions. CO2: Geometrical properties of continuous functions on closed and bounded intervals. CO3: Applications of derivative, relative extrema and mean value theorems. CO4: Higher order derivatives, Taylor's theorem, indeterminate forms and tracing of curves.
II	Core	DSC-6: Ordinary Differential Equations	CO1: Learn the basics of differential equations and compartmental models. CO2: Formulate differential equations for various mathematical models. CO3: Solve first order non-linear differential equations, linear differential equations of higher order and system of linear differential equations using various techniques. CO4: Apply these techniques to solve and analyze various mathematical models.
II	SEC	Essentials of Python	CO1: After studying this course, students will be able to understand the basics of programming language CO2: After studying this course, students will be able to develop, document and debug modular python programs CO3: After studying this course, students will be able to apply suitable programming constructs and built in data structures to solve a problem.

II	SEC	SEC-1: IT Skills and Data Analysis - II	CO1: Establish relationships between variables using correlation and regression analysis. CO2: Visualize functions and differentiate between linear and nonlinear functions. CO3: Use IT tools such as spreadsheets to visualize and analyze data.
II	VAC	VAC-1: Vedic Mathematics-1	CO1: Overcome the fear of mathematics CO2: Improved critical thinking CO3: Familiarity with the mathematical underpinnings and techniques CO4: Ability to do basic mathematics faster and with ease. CO5: Appreciate the Mathematical advancements of Ancient India.
II	VAC	Digital Empowerment	CO1: Use ICT and digital services in daily life. CO2: Develop skills to communicate and collaborate in cyberspace using social platforms, teaching/learning tools. CO3: Understand the significance of security and privacy in the digital world. CO4: Evaluate ethical issues in the cyber world

III	Core	DSC-7: Group Theory	CO1: Analyze the structure of 'small' finite groups, and examine examples arising as groups of permutations of a set, symmetries of regular polygons. CO2: Understand the significance of the notion of cosets, Lagrange's theorem and its consequences. CO3: Know about group homomorphisms and isomorphisms and to relate groups using these mappings. CO4: Express a finite abelian group as the direct product of cyclic groups of prime power orders. CO5: Learn about external direct products and its applications to data security and electric circuits.
III	Core	DCS-8: Riemann Integration	CO1: Learn about some of the classes and properties of Riemann integrable functions, and the applications of the Riemann sums to the volume and surface of a solid of revolution. CO2: Get insight of integration by substitution and integration by parts. CO3: Know about convergence of improper integrals including, beta and gamma functions.
III	Core	DSC-9: Discrete Mathematics	CO1: Understand the notion of partially ordered set, lattice, Boolean algebra with applications. CO2: Handle the practical aspect of minimization of switching circuits to a great extent with the methods discussed in this course. CO3: Apply the knowledge of Boolean algebras to logic, set theory and probability theory.

III	DSE	DSE 1(iii) Number Theory	CO1: Use modular arithmetic in solving linear and system of linear congruence equations. CO2: Work with the number theoretic functions, their properties and their use. CO3: Learn the forms of positive integers that possess primitive roots and the Quadratic Reciprocity Law which deals with the solvability of quadratic congruences. Co4: Understand the public-key cryptosystems, in particular, RSA.
III	SEC	SEC-1: IT Skills and Data Analysis - I	CO1: Represent and interpret data in tabular and graphical forms CO2: Understand and interpret the measures of central tendency and dispersion. CO3: Use IT tools such as spreadsheets to visualize and analyze data.
III	SEC	SEC-1: E-Tourism	CO1: After studying this course, students will be able to gain insight into concept of tourism, travel intermediaries and travel websites. CO2: After studying this course, students will be able to learn and explain the emerging ICT tools and its impact in the industry. CO3: After studying this course, students will be able to understand and implement the use of social media platforms/artificial intelligence in e-tourism.
III	SEC	SEC-1: Document Preparation and Presentation Software	CO1: Create a text document using LaTeX using a standard template. CO2: Incorporate well-formatted mathematical equations, algorithms, figures, tables and references in a document. CO3: Use Zotero for reference management. CO4: Format text, including alignment, emphasis and fonts. CO5: Handle basic aspects of document structure, including sections, subsections, paragraphs, and bulleted and enumerated lists. CO6: Page set a document including header, footer, and page numbering. CO7: Make a presentation.
III	VAC	VAC-1: Vedic Mathematics-1	CO1: Overcome the fear of mathematics CO2: Improved critical thinking CO3: Familiarity with the mathematical underpinnings and techniques CO4: Ability to do basic mathematics faster and with ease. CO5: Appreciate the Mathematical advancements of Ancient India.
III	VAC	Digital Empowerment	CO1: Use ICT and digital services in daily life. CO2: Develop skills to communicate and collaborate in cyberspace using social platforms, teaching/learning tools. CO3: Understand the significance of security and privacy in the digital world. CO4: Evaluate ethical issues in the cyber world

IV	Core	DSC-10: Sequences and Series of Functions	CO1: Learn about Cauchy criterion for uniform convergence and Weierstrass *M*-test for uniform convergence of series of real-valued functions. CO2: Know about the constraints for the inter-changeability of differentiation, and integration with infinite sum of a series of functions. CO3: Handle the convergence of power series and properties of the limit function, including differentiation and integration of power series. CO4: Appreciate utility of polynomials in the space of continuous functions.

IV	Core	DSC-11: Multivariate Calculus	CO1: Learn the conceptual variations when advancing in calculus from one variable to multivariable discussion. CO: Understand the maximization and minimization of multivariable functions subject to the given constraints on variables. CO3: Learn about inter-relationship amongst the line integral, double, and triple integral formulations. CO4: Familiarize with Green's, Stokes' and Gauss divergence theorems, and learn applications.
IV	Core	DSC-12: Numerical Analysis	CO1: Learn some numerical methods to find the zeroes of nonlinear functions of a single variable, up to a certain given level of precision. CO2: Learn Gauss−Jacobi, Gauss−Seidel methods to solve system of linear equations. CO3: Get aware of using interpolation techniques, for example in finding values of a tabulated function at points which are not part of the table. CO4 Learn finding numerical solutions of difference equations which are obtained converting differential equations using techniques from calculus.
IV	DSE	DSE-2(ii): Mathematical Modeling	CO1: Understand the methodology of solving SIR models for disease spread. CO2: Learn significance of dieting model that provides important insights and guides to a biomedical issue that is of interest to the general public. CO3: Understand nonlinear systems and phenomena with stability analysis ranges from phase plane analysis to ecological and mechanical systems. CO4: Use Monte Carlo simulation technique to approximate area under a given curve, and volume under a given surface.
IV	SEC	SEC-1: Document Preparation and Presentation Software	CO1: Create a text document using LaTeX using a standard template. CO2: Incorporate well-formatted mathematical equations, algorithms, figures, tables and references in a document. CO3: Use Zotero for reference management. CO4: Format text, including alignment, emphasis and fonts. CO5: Handle basic aspects of document structure, including sections, subsections,

			paragraphs, and bulleted and enumerated lists. CO6: Page set a document including header, footer, and page numbering. CO7: Make a presentation.
IV	SEC	SEC-1: IT Skills and Data Analysis - II	CO1: Establish relationships between variables using correlation and regression analysis. CO2: Visualize functions and differentiate between linear and nonlinear functions. CO3: Use IT tools such as spreadsheets to visualize and analyze data.
IV	VAC	Digital Empowerment	CO1: Use ICT and digital services in daily life. CO2: Develop skills to communicate and collaborate in cyberspace using social platforms, teaching/learning tools. CO3: Understand the significance of security and privacy in the digital world. CO4: Evaluate ethical issues in the cyber world
IV	VAC	VAC-1: Vedic Mathematics-2	CO1: think critically CO2: Find mathematical solution of algebraic expressions CO3: Solve system of linear equations and matrices faster and with ease. CO4: Appreciate the Mathematical advancements of Ancient India.

V	Core	DSC-13: Metric Spaces	CO1: Learn various natural and abstract formulations of distance on the sets of usual or unusual entities. Become aware one such formulations leading to metric spaces. CO2: Analyze how a theory advances from a particular frame to a general frame. CO3: Appreciate the mathematical understanding of various geometrical concepts, viz. balls or connected sets etc. in an abstract setting. CO4: Know about Banach fixed point theorem, whose far-reaching consequences have resulted into an independent branch of study in analysis, known as fixed point theory. CO5: Learn about the two important topological properties, namely connectedness and compactness of metric spaces.
V	Core	DSC-14: Ring Theory	CO1: Learn about the fundamental concept of rings, integral domains, and fields. CO2: Know about ring homomorphisms and isomorphisms theorems of rings, and construct quotient fields for integral domains. CO3: Appreciate the significance of unique factorization in rings and integral domains. CO4: Apply several criteria for determining when polynomials with integer coefficients have rational roots or are irreducible over the field of rational numbers.

V	Core	DSC-15: Partial Differential Equations	CO1: The method of characteristics and reduction to canonical forms to solve first and second order linear/nonlinear partial differential equations. CO2: The macroscopic modeling of the traffic flow, where the focus will be on modeling the density of cars and their flow, rather than modeling individual cars and their velocity. CO3: The Cauchy problem and solutions of wave equations with initial boundary-value problems, and non-homogeneous boundary conditions.
V	DSE	DSE 3 (i): Mathematical Data Science	CO1: Gain a comprehensive understanding of data science, its mathematical foundations including practical applications of regression, principal component analysis, singular value decomposition, clustering, support vector machines, and k-NN classifiers. CO2: Demonstrate data analysis and exploration, linear regression techniques such as simple, multiple explanatory variables, cross-validation and regularization using R/Python. CO3: Use real-world datasets to practice dimensionality reduction techniques such as PCA, SVD, and multidimensional scaling using R/Python.

V	DSE	DSE-3(ii): Linear Programming and Applications	CO1: Learn about the basic feasible solutions of linear programming problems. CO2: Understand the theory of the simplex method to solve linear programming problems. CO3: Learn about the relationships between the primal and dual problems. CO4: Solve transportation and assignment problems. CO5: Understand two-person zero sum game, games with mixed strategies and formulation of game to primal and dual linear programing problems to solve using duality.
V	SEC	SEC-1: IT Skills and Data Analysis - I	CO1: Represent and interpret data in tabular and graphical forms CO2: Understand and interpret the measures of central tendency and dispersion. CO3: Use IT tools such as spreadsheets to visualize and analyze data.
V	SEC	SEC-1: E-Tourism	CO1: After studying this course, students will be able to gain insight into concept of e-tourism, travel intermediaries and travel websites. CO2: After studying this course, students will be able to learn and explain the emerging ICT tools and its impact in the industry. CO3: After studying this course, students will be able to understand and implement the use of social media platforms/artificial intelligence in e-tourism.

VI	Core	DSC-16: Advanced Group Theory	CO1: Understand the concept of group actions and their applications. CO2: Understand finite groups using Sylow's theorem. CO3: Use Sylow's theorem to determine whether a group is simple or not. CO4: Understand and determine if a group is solvable or not.
VI	Core	DSC17: Advanced Linear Algebra	CO1: Understand the notion of an inner product space in a general setting and how the notion of inner products can be used to define orthogonal vectors, including to the Gram-Schmidt process to generate an orthonormal set of vectors. CO2: Use eigenvectors and eigenspaces to determine the diagonalizability of a linear operator. CO3: Find the Jordan canonical form of matrices when they are not diagonalizable. CO4: Learn about normal, self-adjoint, and unitary operators and their properties, including the spectral decomposition of a linear operator.

VI	Core	DSC-18 Complex Analysis	CO1: Learn the significance of differentiability of complex functions leading to the understanding of Cauchy−Riemann equations. CO2: Learn some elementary functions and valuate the contour integrals. CO3: Understand the role of Cauchy−Goursat theorem and the Cauchy integral formula. CO4: Expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals.
VI	DSE	DSE-4 (iii): Research Methodology	CO1: Develop researchable questions and to make them inquisitive enough to search and verify new mathematical facts. CO2: Understand the methods in research and carry out independent study in areas of mathematics. CO3: Write a basic mathematical article and a research project. CO4: Gain knowledge about publication of research articles in good journals. CO5: Communicate mathematical ideas both in oral and written forms effectively.

VI	SEC	SEC-1: Document Preparation and Presentation Software	CO1: Create a text document using LaTeX using a standard template. CO2: Incorporate well-formatted mathematical equations, algorithms, figures, tables and references in a document. CO3: Use Zotero for reference management. CO4: Format text, including alignment, emphasis and fonts. CO5: Handle basic aspects of document structure, including sections, subsections, paragraphs, and bulleted and enumerated lists. CO6: Page set a document including header, footer, and page numbering. CO7: Make a presentation.
VI	SEC	SEC-2: E-Tourism	CO1: After studying this course, students will be able to gain insight into concept of e-tourism, travel intermediaries and travel websites. CO2: After studying this course, students will be able to learn and explain the emerging ICT tools and its impact in the industry. CO3: After studying this course, students will be able to understand and implement the use of social media platforms/artificial intelligence in e-tourism.
VI	SEC	SEC-3: Cyber Sphere and Security: Global Concerns	CO1: After studying this course, students will be able to apprehend key terms of cyber domain and identify cyber threats. CO2: After studying this course, students will be able to understand cyber law concepts, intellectual property and Digital Rights Management. CO3: After studying this course, students will be able to diagnose and examine basic security loopholes, anomalous behavior in internet. CO4: After studying this course, students will be able to understand principles of web security. CO5: After studying this course, students will be able to secure and protect personal data with safe Internet usage. CO6: After studying this course, students will be able to assimilate approaches for incident analysis and response, risk management and best cyber security practices.
VII	Core	DSC19: Linear Analysis	CO1: Analyze and demonstrate examples of normed linear spaces with their properties. CO2: Characterize the bounded linear operators on normed spaces as continuous functions. Understand and apply Schwarz and Bessel's inequality, Parseval's identity. CO3: Illustrate linear operators, self-adjoint, unitary and normal operators on Hilbert spaces. CO4: Prove and apply fundamental theorems from the theory of normed and Banach spaces.
VII	DSE	DSE-5(i): Advanced Differential	CO1: Existence, uniqueness, and continuity of solutions of IVPs.

		Equation	CO2: Properties of zeros of solutions of linear second order ODE's. CO3: Green's function of a BVP and its applications. CO4: Eigenvalues and eigenfunctions of Sturm-Liouville systems. CO5: Solutions of Laplace, wave, and diffusion equations with their applications.
VII	DSE	DSE-5(v): Optimization	CO1: Learn about the optimal solutions of nonlinear optimization problems. CO2: Understand and apply Karush-Kuhn-Tucker (KKT) necessary and sufficient optimality conditions for nonlinear optimization problems. CO3: Demonstrate and apply Lagrangian duality results, and techniques to solve certain classes of nonlinear optimization problems.
VII	DSE	DSE-5(vi): Research Methodology	CO1: Develop researchable questions and to make them inquisitive enough to search and verify new mathematical facts. CO2: Understand the methods in research and carry out independent study in areas of mathematics. CO3: Write a basic mathematical article and a research project. CO4: Gain knowledge about publication of research articles in good journals. CO5: Communicate mathematical ideas both in oral and written forms effectively.
VIII	Core	DSC-20: Field Theory and Galois Extension	CO1: Identify and construct examples of fields, distinguish between algebraic and transcendental extensions, and characterize normal extensions in terms of splitting fields. CO2: Identify and characterize separable extensions, define Galois extensions, construct examples of automorphism groups of a field as well as prove the fundamental theorem of Galois theory. CO3: Use the Galois theory of equations to prove that a polynomial equation over a field is solvable by radicals if and only if its Galois group is solvable and hence deduce that a general quantic equation is not solvable by radicals. CO4: Define cyclotomic polynomials and find its Galois group using roots of unity, classify finite fields and prove that every finite separable extension is simple.
VIII	DSE	DSE - 6 (ii): Cryptography	CO1: Learn classical cryptosystems Caesar cipher, Monoalphabetic cipher, Hill cipher, Vigenère cipher and their security analysis. CO2: Understand Feistel cipher structure to achieve confusion and diffusion in case of Data Encryption Standard (DES). CO3: Understand Advanced Encryption Standard (AES) structure and its operations along with key generation. CO4: Learn key sharing protocol – Diffie Hellman key exchange, Public-key cryptosystems – RSA, Elgamal, and Elliptic curve cryptography. CO5: Learn Lagrange interpolation secret sharing scheme. CO6: Learn hash functions and their applications, digital signatures scheme.

			CO7: Gain knowledge of code-based cryptography – McEliece cryptosystem.
VIII	DSE	DSE -6 (iv) Geometry of Curves and Surfaces	CO1: Understand the concept of curves and surfaces embedded in the Euclidean spaces $\mathbb{R}nn$. CO2: Compute the curvature and torsion for a curve in the space. CO3: Understand the concept of differential forms and their integration. CO4: Make sense of the infinitesimal distance element via the study of the Riemannian metric. CO5: Get prepared to venture into further study of modern differential geometry of manifolds.
VIII	DSE	DSE-6 (v): Integral equations and Calculus of Variations	CO1: Compute the solutions to Volterra integral equations by method of resolvent kernel, method of successive approximations, method of Laplace transform, system of Volterra integral equations and integro-differential equation. CO2: Determine the solutions of Fredholm integral equations and derivation of Hilbert-Schmidt theorem. CO3: Understand the formulation of variational problems, the variation of a functional and its properties, extremum of functional, necessary condition for an extremum.

GENERIC ELECTIVE (GE) Courses for Honours Courses (For students other than B.Sc. (Hons.) Mathematics)

Sem	Type of Course	Course Name	Course Outcomes
I	GE	GE-1: Fundamentals of Calculus	CO1: Understand continuity and differentiability in terms of limits. CO2: Describe asymptotic behavior in terms of limits involving infinity. CO3: Understand the importance of mean value theorems and its applications. CO4: Learn about Maclaurin's series expansion of elementary functions. CO5: Use derivatives to explore the behavior of a given function, locating and classifying its extrema, and graphing the polynomial and rational functions.
II	GE	GE-2: Introduction to Linear Algebra	CO1: Visualize the space $RRnn$ in terms of vectors and the interrelation of vectors with matrices. CO2: Understand important uses of eigenvalues and eigenvectors in the diagonalization of matrices. CO3: Familiarize with concepts of bases, dimension and minimal spanning sets in vector spaces. CO4: Learn about linear transformation and its corresponding matrix.

III	GE	GE-3: Differential Equations	CO1: Solve the exact, linear, Bernoulli equations, find orthogonal trajectories and solve rate problems. CO2: Apply the method of undetermined coefficients and variation of parameters to solve linear differential equations. CO3: Solve Cauchy-Euler equations and System of linear differential equations. CO4: Formulate and solve various types of first and second order partial differential equations.
IV	GE	GE-4(i): Elements of Real Analysis	CO1: Understand the basic properties of the set of real numbers, including completeness and Archimedean with some consequences. CO2: Recognize bounded, convergent, monotonic and Cauchy sequences CO3: Learn to apply various tests such as limit comparison, ratio, root, and alternating series tests for convergence and absolute convergence of infinite series of real numbers.
V	GE	GE 5(iii): Elementary Mathematical Analysis	CO1: Apply equential cotinuity vriterion for the proof of intermediate value theorm. CO2: Understand the basic tool used to calculate integral. CO3: Apply uniform convergence for term by term integration.
VI	GE	GE 6(iii): Abstract Algebra	CO1: Appreciate ample types of groups present around us which explains our surrounding better, and classify them as abelian, cyclic and permutation groups. CO2: Explain the significance of the notion of cosets, normal subgroups and homomorphisms. Co3: Understand the fundamental concepts of rings, subrings, fields, ideals, and factor rings.
VII	GE	GE-7(i): Applied Algebra	CO1: Understand the system of linear equations, matrices, and transformations in the fields of economics, science, engineering, and computer science. CO2: Apply the combinatorics and graph theory in scheduling and reliability theory. CO3: Learn about identification numbers and using check digits to check for errors after the identification number has been transmitted.

VII	GE	GE 7(iii): Introduction to Graph Theory	CO1: Good familiarity with all initial notions of graph theory and related results and seeing them used for some real-life problems. CO2: Learning notion of trees and their enormous usefulness in various problems. CO3: Learning various algorithms and their applicability. CO4: Studying planar graphs, Euler theorem associated to such graphs and some useful applications like coloring of graphs.
VII	GE	GE 7(iv): Topics in Multivariate Calculus	CO1: Learn the conceptual variations when advancing in calculus from one variable to multivariable discussion. CO2: Understand the maximization and minimization of multivariable functions subject to the given constraints on variables. CO3: Learn about inter-relationship amongst the line integral, double and triple integral formulations. CO4: Familiarize with Green's, Stokes' and Gauss divergence theorems.
VIII	GE	GE 8(ii): Elements of partial differential equations	CO1: Charpit's and Jacobi's methods to solve first-order nonlinear partial differential equations in two and three independent variables, respectively. CO2: Monge's method for integrating PDE of type Rr + Ss + Tt = V. CO3: The Cauchy problem and solutions of one-dimensional wave equations with initial boundary-value problems, and vibration of finite string with fixed ends. CO4: The macroscopic modeling of the traffic flow, where the focus will be on modeling the density of cars and their flow, rather than modeling individual cars and their velocity.
VIII	GE	GE 8(iv): Optimization techniques	CO1: Nonlinear programming problems and their applications CO2: Method to solve fractional programming problems with linear constraints CO3: Methods to solve dynamic programming problems using recursive computations

MATHEMATICS COURSES FOR B.A. (PROG.)

Sem	Type of Course	Course Name	Course Outcomes

I	Core Major	DSC-1: Elements of Discrete Mathematics	CO1: Understand the basic concepts of sets, relations, functions, and induction. CO2: Understand mathematical logic and logical operations to various fields. CO3: Understand the notion of order and maps between partially ordered sets. CO4: Minimize a Boolean polynomial and apply Boolean algebra techniques to decode switching circuits.
I	Core Minor	DSC-1 Topics in Calculus	CO1: Understand continuity and differentiability in terms of limits and graphs of certain functions. CO2: Describe asymptotic behaviour in terms of limits involving infinity. CO3: Use of derivatives to explore the behaviour of a given function locating and classify its extrema and graphing the function. CO4: Apply the concepts of asymptotes, and inflexion points in tracing of cartesian curves. CO5: Compute the reduction formulae of standard transcendental functions with applications
II	Core Major	DSC-2: Analytic Geometry	CO1: Learn concepts in two-dimensional geometry. CO2: Identify and sketch conics namely, ellipse, parabola and hyperbola. CO3: Learn about three-dimensional objects such as straight lines and planes using vectors, spheres, cones and cylinders.
II	Core Minor	DSC-2 (Discipline-A-2) Elementary Linear Algebra	CO1: To introduce the concept of vectors in $RRnn$. CO2: Understand the nature of solution of system of linear equations. CO3: To view the $mm \times nn$ matrices as a linear function from $RRnn$ to $RRmm$ and vice versa. CO4: To introduce the concepts of linear independence and dependence, rank and linear transformations has been explained through matrices. CO4: Get an overview of abstract algebra by learning about algebraic structures namely, groups, rings and vector spaces.

III	Core Major	DSC-3: Theory of Equations and Symmetries	CO1: Understand the nature of the roots of polynomial equations and their symmetries. CO2: Solve cubic and quartic polynomial equations with special condition on roots and in general. CO3: Find symmetric functions in terms of the elementary symmetric polynomials.

III	Core Minor	DSC-3: Differential Equations	CO1: Solve the exact, linear, Bernoulli equations, find orthogonal trajectories and solve rate problems. CO2: Apply the method of undetermined coefficients and variation of parameters to solve linear differential equations. CO3: Solve Cauchy-Euler equations and System of linear differential equations. CO4: Formulate and solve various types of first and second order partial differential equations
IV	Core Major	DSC-4: Introduction to Graph Theory	CO1: Good familiarity with all initial notions of graph theory and related results and seeing them used for some real-life problems. CO2: Learning notion of trees and their enormous usefulness in various problems. CO3: Learning various algorithms and their applicability. CO4: Studying planar graphs, Euler theorem associated to such graphs and some useful applications like coloring of graphs.
IV	Core Minor	DSC-4 (Discipline A-4): Abstract Algebra	CO1: Appreciate ample types of groups present around us which explains our surrounding better, and classify them as abelian, cyclic and permutation groups. CO2 Explain the significance of the notion of cosets, normal subgroups and homomorphisms. CO3: Understand the fundamental concepts of rings, subrings, fields, ideals, and factor rings.
V	B. A. (P): Major	DSC-5: Linear Programming	CO1: Learn about the simplex method used to find optimal solutions of linear optimization problems subject to certain constraints. CO2: Write the dual of a linear programming problem. CO3: Solve the transportation and assignment problems. CO4: Learn about solution of rectangular games using graphical method and dominance. CO5: Formulate game to a pair of associated prima-dual linear programming problems.
V	B. A. (P) : Minor	Discipline A-6: Elements of Real Analysis	CO1: Understand the basic properties of the set of real numbers, including completeness and Archimedean with some consequences. CO2: Recognize bounded, convergent, monotonic and Cauchy sequences CO3: Learn to apply various tests such as limit comparison, ratio, root, and alternating series tests for convergence and absolute convergence of infinite series of real numbers.

V	B. A. (P)	DSE 1(ii): Elements of Number Theory	CO1: Get familiar with the basic number-theoretic techniques. CO2: Comprehend some of the open problems in number theory. CO3: Learn the properties and use of number-theoretic functions and special types of numbers. CO4: Acquire knowledge about public-key cryptosystems, particularly RSA.

VI	Minor	DSC-6: Elementary Mathematical Analysis	CO1: Apply sequential continuity criterion for the proof of intermediate value theorem. CO2: Understand the basic tool used to calculate integrals. CO3: Apply uniform convergence for term-by-term integration in power series expansion.
VI	Major	Discipline A-6: Probability and Statistics	CO1: Understand some basic concepts and terminology-population, sample, descriptive and inferential statistics including stem-and-leaf plots, dot plots, histograms and boxplots. CO2: Learn about probability density functions and various univariate distributions such as binomial, hypergeometric, negative binomial, Poisson, normal, exponential, and lognormal. CO3: Understand the remarkable fact that the empirical frequencies of so many natural populations, exhibit bell-shaped (i.e., normal) curves, using the Central Limit Theorem. CO4: Measure the scale of association between two variables, and to establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.
VI	DSE	DSE 2(iii) Research Methodology	CO1: Develop researchable questions and to make them inquisitive enough to search and verify new mathematical facts. CO2: Understand the methods in research and carry out independent study in areas of mathematics. CO3: Write a basic mathematical article and a research project. CO4: Gain knowledge about publication of research articles in good journals. CO5: Communicate mathematical ideas both in oral and written forms effectively.
VII	DSC Major	DSC-7: Numerical Methods	CO1: Find the consequences of finite precision and the inherent limits of numerical methods. CO2: Appropriate numerical methods to solve algebraic and transcendental equations. CO3: Solve first order initial value problems of ODE's numerically using Euler methods.

VII	DSE	DSE 2(iii) Research Methodology	CO1: Develop researchable questions and to make them inquisitive enough to search and verify new mathematical facts. CO2: Understand the methods in research and carry out independent study in areas of mathematics. CO3: Write a basic mathematical article and a research project. CO4: Gain knowledge about publication of research articles in good journals. CO5: Communicate mathematical ideas both in oral and written forms effectively.
VIII	DSC Major	DSC-8: Topics in Multivariate Calculus	CO1: Learn the conceptual variations when advancing in calculus from one variable to multivariable discussion. CO2: Understand the maximization and minimization of multivariable functions subject to the given constraints on variables. CO3: Learn about inter-relationship amongst the line integral, double and triple integral formulations. CO4: Familiarize with Green's, Stokes' and Gauss divergence theorems.
VIII	DSE	DSE-4(ii): Elements of Partial Differential Equations	CO1: Charpit's and Jacobi's methods to solve first-order nonlinear partial differential equations in two and three independent variables, respectively. CO2: Monge's method for integrating PDE of type Rr + Ss + Tt = V. CO3: The Cauchy problem and solutions of one-dimensional wave equations with initial boundary-value problems, and vibration of finite string with fixed ends. CO4: The macroscopic modeling of the traffic flow, where the focus will be on modeling the density of cars and their flow, rather than modeling individual cars and their velocity.
VIII	DSE	DSE-4(v): Rings and Fields	CO1: Have familiar with the algebraic structure rings, its maximal ideals, and quotient rings. CO2: Understand the polynomial rings in one variable over a field with the help of the concept of Euclidean rings. CO3: Learn the field extensions and the existence, uniqueness of splitting fields of any polynomial over a field. CO4: Gain the knowledge of structure of finite fields, constructability of numbers using straightedge and compass.