Department Of Mathematics

Curricular Relevance: Course Outcomes with Relevance to Local, Regional, National, Global Needs

Sr. No.	Course Title (Proposed new)	Course Code	Year Of Introduction	COs/POs with relevance to local/ regional needs	COs/POs with relevance to national needs	COs/POs with relevance to global needs
B.Sc. I Mathematics (Newly introduced between 2018-2019)					
1	Differential Calculus I and II	DSC-1003A	2018-19		CO1: Understand higher order derivative and its application	CO3: Understand the consequences of various mean value theorems on differentiable functions
2	Differential Equations	DSC-1003B	2018-19		CO1: Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order CO4: Solve homogeneous and non – homogeneous partial differential equation PO2: To develop scientific outlook with respect to science subject	CO1: Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order CO4: Solve homogeneous and non – homogeneous partial differential equation

B.Com I. Mathematics (Newly Introduced between 2018-19)					
3	Business Mathematics Paper I	GEC-1045A	2018-19		CO1: Familiarize concept of series, different types of interest and can solve respective examples CO4: Solve the examples using different method of LPP	CO2: Familiarize concept of series, different types of interest and can solve respectiveexamples
4	Business Mathematics Paper II	GEC-1045B	2018-19		CO4: Determine cost revenue and calculate integration by using different methods	
M.Sc. I Mathematics (Newly introduced between 2018-2019)					
5	Algebra	CP-1170A	2018-19		PO1: Demonstrate and apply the fundamental knowledge of the basic principles of sciences in various fields	
6	Advanced Calculus	CP-1171A	2018-19		CO1: Make use of Greens Theorem, Stokes Theorems for an arc rectification of curve.	CO2: Analyse convergence of sequences and series of functions.
7	Complex Analysis	CP-1172A	2018-19		CO4: Evaluate integral of complex valued functions along given curve.	CO2: Find power series expansion of an analytic function with radius of convergence.
8	Ordinary Differential Equations	CP-1173A	2018-19		CO3: Apply Picard's successive approximation method to find approximate solution of initial value problem.	CO3: Apply Picard's successive approximation method to find approximate solution of initial value problem.
9	Classical Mechanics	CP-1174A	2018-19		CO4: Analyse motion of system of particles through Lagrangian & Hamiltonian principles.	CO2: Apply principle of variation of calculus for extremization of problem. CO4: Analyse motion of system of particles throughLagrangian & Hamiltonian principles.
10	Linear Algebra	CP-1175B	2018-19		CO3: Construct canonical forms and bilinear forms.	CO2: Study the properties of vector spaces, linear transformations, algebra of linear transformations and inner product spaces in detail..

11	Measure and Integration	CP-1176B	2018-19		PO1: Demonstrate and apply the fundamental knowledge of the basic principles of sciences in various fields	CO4: Able to use the concept of measure theory to solve the problems related to probability theory, stochastic calculus and functional analysis
12	General Topology	CP-1177B	2018-19		CO3: The student is able to apply his or her knowledge of general topology to formulate and solve problems of a topological nature in mathematics and other fields where topological issues arise.	
13	Partial Differential Equations	CP-1178B	2018-19		CO2: Use different method to solve boundary value problem specially use wave equations, Heat equations	CO3:Understand what are well-posed initial (and / or boundary) value problems for classical PDEs such as the wave equation, the Laplace equation and the heat (diffusion) equation
14	Numerical Analysis	CP-1179B	2018-19	CO1: Solve linear and non-linear equations by various numerical methods	CO3: Solve initial value problems by different numerical methods.	
B.Sc. II Mathematics (Newly introduced between 2019-2020)						
15	Differential Calculus	DSC-1003C	2019-20		CO4: Make use of vector differentiation to study various physical phenomenon	CO4: Make use of vector differentiation to study various physical phenomenon
16	Integral Calculus	DSC-1003C	2019-20	CO2: Use double and triple integration to find the area, volume of the given region	CO2: Use double and triple integration to find the area, volume of the given region CO1: Solve improper integral by using beta and gamma function	CO2: Use the knowledge of double and triple integrals for finding area and volume PO2: To develop scientific outlook with respect to science subject

17	Discrete Mathematics	DSC-1003D	2019-20		CO4: Learn Boolean Algebra terms and apply to solve various circuit problem CO3: Formulate Recurrence relations to solve problems involving an unknown sequences	CO3: Formulate Recurrence relations to solve problems involving an unknown sequences
18	Integral Transform	DSC-1019D	2019-20		CO2: Make use of the transformation to solve differential equations.	CO2: Make use of the transformation to solve differential equations
				M.Sc. II Mathematics (Newly introduced between 2019-2020)		
19	Functional Analysis	CC -1180C	2019-20		CO2: Understand and apply fundamental theorems from the theory of normed and Banach spaces, including the Hahn-Banach theorem, the open mapping theorem, the closed graph theorem.	CO3: Able to understand Hilbert space and its application and acquire knowledge of orthogonal sets and operators
20	Advanced Discrete Mathematics	CC -1181C	2019-20	CO2: Determine if a given graph is simple or a multigraph, directed or undirected graph, cyclic or acyclic, and determine the connectivity of a graph.	CO3: To determine if graph has a Euler or a Hamiltonian path or circuit, Define Pigeonhole principle and solve problems related to this.	.
21	Number Theory	CBC -1182C	2019-20		CO3: Able to explore basic idea of cryptography.	
22	Graph Theory I	CBC -1183C	2019-20	CO2: Define vertex colouring and prove theorems on vertex colouring.		CO4: Evaluate or synthesize any real -world applications using graph theory.
23	Operational Research –I	CBC -1184C	2019-20	CO2: Able to solve multi –level decision problems using dynamic	CO3: Able to identify the appropriate methods to solve the different kinds of Optimization Problems.	CO4: Formulate the nonlinear programming models and able to find solution methods for solving

				programming method.	CO4: Formulate the nonlinear programming models and able to find solution methods for solving the nonlinear and linear optimization problems.	the nonlinear and linear optimization problems.
24	Lattice Theory - I	CBC - 1185C	2019-20		CO2: Study the basic properties and characterization of lattice	
25	Dynamical System I	CBC - 1186C	2019-20		CO2: Construct bifurcation diagrams and analyze the system for different values of parameter	CO2: Construct bifurcation diagrams and analyze the system for different values of parameter
26	Commutative Algebra	CBC - 1187C	2019-20			CO2: Understand various radicals and know Hilbert basis theorem and apply it to other development.
27	Field Theory	CC-1190D	2019-20		CO1:Apply the knowledge of algebra to attain a good mathematical maturity and enables to build mathematical thinking and reasoning	CO4:Identify the challenging problems in advanced algebra to pursue further research.
28	Integral Equations	CC-1191D	2019-20		PO1:Demonstrate and apply the fundamental knowledge of the basic principles of sciences in various fields.	
29	Algebraic number theory	CBC-1192D	2019-20		CO2: Understand and clearly define number fields and their ring of integers, in particular quadratic number fields and cyclotomic number fields.	
30	Graph theory II	CBC-1193D	2019-20			CO4: Explain major theorems and inventions in the history of graph theory and understand how it made the subject to develop to the present state.
31	Operation Research II	CBC-1194D	2019-20	CO1:Decide an optimal replacement period/policy for a given	CO2: Understand the various selective inventory control techniques and its applications. Capability to develop deterministic inventory models	CO4: Understand application of PERT and CPM techniques and able to construct network diagrams.

				item/equipment/machine	CO3: Understand the mathematical modeling of queuieng systems To apply and extend queueing models to analyze real world systems.	
32	Fluid Dynamics	CBC-1195D	2019-20		CO1: Apply Bernoulli's equation to fluid flow problems and boundary layer theory to determine lift and drag forces on a submerged body.	CO1: Apply Bernoulli's equation to fluid flow problems and boundary layer theory to determine lift and drag forces on a submerged body.
33	Dynamical System II	CBC-1196D	2019-20			CO4: Identify the chaotic behaviour in the system by using Lyapunov exponents
34	Combinatorics	CBC-1197D	2019-20	CO4: Identify the challenging problems in arrangement and selections		
35	Fractional Differential Calculus	CBC-1198D	2019-20			CO3: To Solve Linear Fractional Differential Equation using the Laplace and Mellin transform
B.Sc. III Mathematics (Newly introduced between 2020-2021)						
36	Real Analysis	DSC-1003E1	2020-21	PO2: To develop scientific outlook with respect to science subject	CO3: Learn Riemann integral and improper integral	
37	Modern Algebra	DSC -1003E1	2020-21	PO2: To develop scientific outlook with respect to science subject	CO2: Understand Properties and terminologies related to Group and Ring.	
38	Matrix Algebra	DSC-1003E2	2020-21	CO2: To solve system of homogeneous and non-homogeneous equations.	CO2: To solve system of homogeneous and non-homogeneous equations. CO3: Calculate eigen values and corresponding eigen vectors of square matrix	CO3: Calculate eigen values and corresponding eigen vectors of square matrix

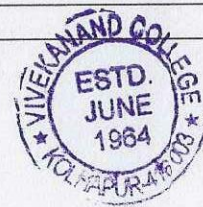|						
39	Numerical Methods I	DSC-1003E2	2020-21		CO2: Use appropriate numerical methods and determine approximate solutions to systems of linear equations and ordinary differential equations. CO1: Use approximate numerical methods and determine the solutions to give non-linear equations. PO2: To acquire the skills in handling scientific instruments	CO2: Use appropriate numerical methods and determine approximate solutions to systems of linear equations and ordinary differential equations. CO1: Use approximate numerical methods and determine the solutions to give non-linear equations.
40	Metric Space	DSC – 1003F1	2020-21		PO2: To develop scientific outlook with respect to science subject	CO3: Understand the basic concepts of connectedness, completeness and compactness of metric space
41	Linear Algebra	DSC – 1003F1	2020-21		CO1: Understand the concept of Vector spaces and operators on them. CO3: Learn basic concept of linear transformation, dimension theorem	CO1: Understand the concept of Vector spaces and operators on them. CO3: Learn basic concept of linear transformation, dimension theorem
42	Complex Analysis	DSC – 1003F2	2020-21			CO2: Learn Differentiation and Integration of complex valued functions.
43	Numerical Methods II	DSC – 1003F2	2020-21		CO3: Demonstrate the use of interpolation methods to find intermediate values in given graphical and/or tabulated data. PO2: To acquire the skills in handling scientific instruments	CO3: Demonstrate the use of interpolation methods to find intermediate values in given graphical and/or tabulated data.

B.Sc. I Mathematics (Newly introduced between 2021-2022)

44	Calculus	DSC-1003A	2021-22		CO2: Understand the consequences of various mean value theorems for differentiable functions.	
45	Algebra and Geometry	DSC - 1003A	2021-22		CO2: Employ DeMoivres theorem in number of applications to solve numerical problems	
46	Multivariable Calculus	DSC-1003B	2021-22		CO2: Learn to apply multivariable calculus in optimization problem	
47	Ordinary Differential Equations	DSC-1003B	2021-22			CO3: Formulate mathematical models in the form of ordinary differential equations to suggest solutions of day to day problems arising in physical, chemical and biological disciplines
B.Com. I Mathematics (Newly introduced between 2021-2022)						
48	Business Mathematics Paper I	GEC-1045A	2021-22		CO2: Familiarize concept of series, different types of interest and can solve respective examples CO4: Solve the examples using different method of LPP	CO2: Familiarize concept of series, different types of interest and can solve respective examples
49	Business Mathematics Paper II	GEC-1045B	2021-22		CO4:Determine cost revenue and calculate integration by using different methods	
M.Sc. I Mathematics (Newly introduced between 2021-2022)						
50	Algebra	CP -1170A	2021-22			CO1:check solvability of groups via Sylows theorems.
51	Advanced Calculus	CP-1171A	2021-22		CO1: Make use of Greens Theorem, Stokes Theorems for an arc rectification of curve.	CO2: Analyse convergence of sequences and series of functions.
52	Complex Analysis	CP -1172A	2021-22		CO4: Evaluate integral of complex valued functions along given curve.	CO2: Find power series expansion of an analytic function with radius of convergence.

53	Ordinary Differential Equations	CP -1173A	2021-22		CO3: Apply Picard's successive approximation method to find approximate solution of initial value problem.	CO3: Apply Picard's successive approximation method to find approximate solution of initial value problem.
54	Classical Mechanics	CP -1174A	2021-22		CO4: Analyse motion of system of particles through Lagrangian & Hamiltonian principles.	CO2: Apply principle of variation of calculus for extremization of problem. CO4: Analyse motion of system of particles through Lagrangian & Hamiltonian principles.
55	Linear Algebra	CP-1175B	2021-22		CO3: Construct canonical forms and bilinear forms.	CO2: Study the properties of vector spaces, linear transformations, algebra of linear transformations and inner product spaces in detail..
56	Integral Equations	CP -1176B	2021-22			CO4: Formulate and solve initial and boundary value problems for the heat and wave equations in spherical and cylindrical coordinates.
57	General Topology	CP-1177B	2021-22		CO3: The student is able to apply his or her knowledge of general topology to formulate and solve problems of a topological nature in mathematics and other fields where topological issues arise.	
58	Partial Differential Equations	CP-1178B	2021-22		CO2: Use different method to solve boundary value problem specially use wave equations, Heat equations	CO3:Understand what are well-posed initial (and/or boundary) value problems for classical PDEs such as the wave equation, the Laplace equation and the heat (diffusion) equation
59	Numerical Analysis	CP -1179B	2021-22		CO3: Solve initial value problems by different numerical methods.	
	B.Sc. II Mathematics (Newly introduced between 2022-2023)					

60	Number Theory	DSC-1003C	2022-23			CO1: Use mathematical induction and understand the logic and methods behind the major proofs in Number Theory.
61	Integral Calculus	DSC-1003C	2022-23		CO4: Use the knowledge of double and triple integrals for finding area and volume	CO4: Use the knowledge of double and triple integrals for finding area and volume
62	Discrete Mathematics	DSC – 1003 D	2022-23		CO1: Understand Recurrence Relation, Generating functions and solving problems involving recurrence equations.	CO1: Understand Recurrence Relation, Generating functions and solving problems involving recurrence equations.
63	Integral Transform	DSC – 1003D	2022-23		CO4: apply the knowledge of Laplace transforms, Fourier transforms and Finite Fourier transforms in finding the solutions of differential equations.	CO4: apply the knowledge of Laplace transforms, Fourier transforms and Finite Fourier transforms in finding the solutions of differential equations.
M.Sc. II Mathematics (Newly introduced between 2022-2023)						
64	Functional Analysis	CC -1180C	2022-23		CO2: Understand and apply fundamental theorems from the theory of normed and Banach spaces, including the Hahn-Banach theorem, the open mapping theorem, the closed graph theorem.	CO3: Able to understand Hilbert space and its application and acquire knowledge of orthogonal sets and operators
65	Advanced Discrete Mathematics	CC -1181C	2022-23	CO2: Determine if a given graph is simple or a multigraph, directed or undirected graph, cyclic or	CO3: To determine if graph has a Euler or a Hamiltonian path or circuit, Define Pigeonhole principle and solve problems related to this.	.

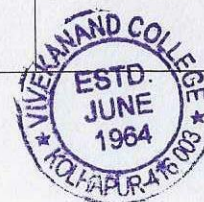|				acyclic, and determine the connectivity of a graph.		CO3: Able to explore basic idea of cryptography.
66	Number Theory	CBC - 1183C	2022-23			CO3: Able to explore basic idea of cryptography.
67	Fuzzy Mathematics I	CBC - 1185C	2022-23			CO4: Demonstrate the technologies of fuzzy sets and fuzzy numbers
68	Operational Research –I	CBC - 1184C	2022-23	CO2: Able to solve multi –level decision problems using dynamic programming method.	CO3: Able to identify the appropriate methods to solve the different kinds of Optimization Problems. CO4: Formulate the nonlinear programming models and able to find solution methods for solving the nonlinear and linear optimization problems.	CO4: Formulate the nonlinear programming models and able to find solution methods for solving the nonlinear and linear optimization problems.
69	Lattice Theory - I	CBC - 1182C	2022-23		CO2: Study the basic properties and characterization of lattice	
70	Dynamical System I	CBC - 1186C	2022-23		CO2: Construct bifurcation diagrams and analyze the system for different values of parameter	CO2: Construct bifurcation diagrams and analyze the system for different values of parameter
71	Commutative Algebra	CBC - 1187C	2022-23		PO1:Demonstrate and apply the fundamental knowledge of the basic principles of sciences in various fields.	CO2: Understand various radicals and know Hilbert basis theorem and apply it to other development.
72	Field Theory	CC-1190D	2022-23		CO1:Apply the knowledge of algebra to attain a good mathematical maturity and enables to build mathematical thinking and reasoning	CO4:Identify the challenging problems in advanced algebra to pursue further research.
73	Measure and Integration	CC-1191D	2022-23		CO3: Able to construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.	CO4: Able to use the concept of measure theory to solve the problems related to probability theory, stochastic calculus and functional analysis

74	Algebraic number theory	CBC-1192D	2022-23		CO2: Understand and clearly define number fields and their ring of integers, in particular quadratic number fields and cyclotomic number fields.	PO1:Demonstrate and apply the fundamental knowledge of the basic principles of sciences in various fields.
75	Fuzzy Mathematics II	CBC-1193D	2022-23		CO4: Solve problems in Engineering and medicine	
76	Operation Research II	CBC-1194D	2022-23	CO1:Decide an optimal replacement period/policy for a given item/equipment/machine	CO2: Understand the various selective inventory control techniques and its applications. Capability to develop deterministic inventory models CO3: Understand the mathematical modeling of queuieng systems To apply and extend queueing models to analyze real world systems.	CO4: Understand application of PERT and CPM techniques and able to construct network diagrams.
77	Introduction to data science	CBC-1195D	2022-23	PO4: Apply knowledge to build up small-scale industries for developing endogenous products	CO1: Having an ability to apply mathematics and science in AI and machine learning applications	CO4: Having an ability to use techniques, skills and modern engineering tools necessary for engineering practice
78	Dynamical System II	CBC-1196D	2022-23			CO4: Identify the chaotic behaviour in the system by using Lyapunov exponents
79	Combinatorics	CBC-1197D	2022-23	CO4: Identify the challenging problems in arrangement and selections		
80	Fractional Differential Calculus	CBC-1198D	2022-23			CO3: To Solve Linear Fractional Differential Equation using the Laplace and Melin transform
	B.Sc.III. Mathematics (Newly Introduced between 2023-24)					
81	Real Analysis	DSC – 1003E1	2023-24		CO3: Understand some of the families and properties of	CO1: Recognize bounded, convergent, divergent, Cauchy and

						Riemann integrable functions, and the applications of the fundamental theorems of integration	monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence
82	Modern Algebra	DSC – 1003E1	2023-24				CO4:Apply fundamental theorem, Isomorphism theorems of groups to prove these theorems for Ring.
83	Partial Differential Equations	DSC - 1003E2	2023-24			CO3: Understand the Geometrical meaning of partial differential equation and method of solutions.	CO4: Understand transformation equations and its applications
84	Numerical Methods	DSC – 1003E2	2023-24	CO2: Demonstrate the use of interpolation methods to find intermediate values in given graphical and/or tabulated data	CO4: Learn to find the solution of ordinary differential equation by Euler, Taylor and Runge-Kutta method PO2: To acquire the skills in handling scientific instruments	CO4: Learn to find the solution of ordinary differential equation by Euler, Taylor and Runge-Kutta method
85	Metric space	DSC - 1003F1	2023-24				CO4. Understand the basic concepts of connectedness, completeness and compactness of metric spaces
86	Linear Algebra	DSC - 1003F1	2023-24			CO3: Learn basic concepts of linear transformation, dimension theorem, matrix representation of a linear transformation, and the change of coordinate matrix.	CO2: Learn properties of inner product spaces and determine orthogonality in inner product spaces
87	Complex Analysis	DSC – 1003F2	2023-24				CO4: Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem
88	Optimization Technique	DSC – 1003F2	2023-24	CO3: Identify and select procedures for various sequencing, assignment, transportation problems.	CO4: Model competitive real-world phenomena using concepts from game theory and analyse pure and mixed strategy games.	CO4: Model competitive real-world phenomena using concepts from game theory and analyse pure and mixed strategy games.	

					CO1: Analyse and solve linear programming models of real-life situations.		

B.Sc. I Mathematics NEP (Introduced in 2023-24)

89	Differential Calculus	DSC03MAT11	2023-24		CO2: Understand the consequences of various mean value theorems for differentiable functions.	PO2: To develop scientific outlook with respect to science subject
90	Basic Algebra and Complex Numbers	DSC03MAT12	2023-24		CO3: Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank	CO2: Employ De Moivre's theorem in a number of applications to solve numerical problems
91	Differential Calculus	MIN03MAT11	2023-24		CO2: Understand the consequences of various mean value theorems for differentiable functions.	PO2: To develop scientific outlook with respect to science subject
92	Basic Algebra and Complex Numbers	MIN03MAT12	2023-24		CO3: Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank	CO2: Employ De Moivre's theorem in a number of applications to solve numerical problems
93	Logical Reasoning	OEC03MAT11	2023-24	CO4: Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability CO1: Understand the basic concepts of logical reasoning Skills	PO4:To analyse the given scientific data critically and systematically	
94	Quantitative Aptitude	OEC03MAT12	2023-24	CO4: Compete in various competitive exams like CAT, CMAT, GATE, GRE,	CO4: Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.	CO2: Familiarize basic concepts of Permutation and Combinations.

				GATE, UPSC, GPSC etc. CO2: Familiarize basic concepts of Permutation and Combinations.	PO4: To analyse the given scientific data critically and systematically	
95	Indian Knowledge System	IKS03GEC 11	2023-24	PO5: To realize ethical moral and social values in personal and social life		
96	Differential Equations I	DSC03MA T21	2023-24		CO1: Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations	
97	Geometry	DSC03MA T22	2023-24		CO3: Understand the various equation from sphere	
98	Differential Equations I	MIN03MA T21	2023-24		CO1: Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations	
99	Geometry	MIN03MA T22	2023-24		CO3: Understand the various equation from sphere	
100	Quantitativ e Analysis	OEC03MA T21	2023-24	CO2: Familiarize basic concepts of simple and compound interest. CO3: Interpret the bar, pie, line chart	CO2: Familiarize basic concepts of simple and compound interest. CO3: Interpret the bar, pie, line chart	
101	Introductio n to Applied Mathematic s	OEC03MA T22	2023-24		CO4: Learn to find feasible solution of linear programming problem.	

102	Foundation of Mathematics	SEC03MAT29	2023-24		CO2: Apply techniques of proof to prove the statement in different ways.	CO2: Apply techniques of proof to prove the statement in different ways
B.Com. I Mathematics (NEP) (Newly introduced between 2023-2024)						
103	Business Mathematics I		2023-24		CO1: Familiarize concept of series, different types of interest and can solve respective examples CO4: Solve the examples using different method of LPP	CO2: Familiarize concept of series, different types of interest and can solve respective examples
104	Business Mathematics II		2023-24	CO1: Explain concepts of permutation and combinations and can solve examples on it	CO4: Identify and select procedure for various Assignment and transportation problems	
M.Sc. I Mathematics (NEP) (Newly introduced between 2023-2024)						
105	Modern Algebra	DSC13MAT11	2023-24		PO1: Demonstrate and apply the fundamental knowledge of the basic principles of sciences in various fields.	
106	Ordinary Differential Equations	DSC13MAT12	2023-24		CO3: Apply Picard's successive approximation method to find approximate solution of initial value problem.	CO4: Apply the Lipschitz condition of successive approximation.
107	Measure and Integration	DSC13MAT13	2023-24		CO4: Able to characterize Riemann and Lebesgue integrability.	CO3: Able to construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.
108	Numerical Analysis I	DSC13MAT14	2023-24		CO1: Apply the methods to solve linear and non linear equations	CO2: Solve differential equations using various numerical methods
109	Operational Research	DSE13MAT11	2023-24		CO2: Construct linear integer programming models and discuss the solution techniques, CO4: Solve multi –level decision problems using dynamic programming method.	CO3: Formulate the nonlinear programming models, and propose the best strategy using decision making methods

110	Introduction to data science	DSE13MAT12	2023-24	PO4: Apply knowledge to build up small-scale industries for developing endogenous products	CO1: Having an ability to apply mathematics and science in AI and machine learning applications	CO4: Having an ability to use techniques, skills and modern engineering tools necessary for engineering practice
111	Dynamical System I	DSE13MAT13	2023-24		CO2: Construct bifurcation diagrams and analyze the system for different values of parameter	CO2: Construct bifurcation diagrams and analyze the system for different values of parameter
112	Research Methodology	MIN13MAT11	2023-24		CO1: Design and formulate research problem and Analyse research related information and follow research ethics. CO4: Analyse that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products	CO1: Design and formulate research problem and Analyse research related information and follow research ethics. CO4: Analyse that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products PO5: Communicate scientific information in a clear and concise manner both orally and in writing.
113	Linear Algebra	DSC13MAT21	2023-24		CO3: Construct canonical forms and bilinear forms.	CO2: Study the properties of vector spaces, linear transformations, algebra of linear transformations and inner product spaces in detail..
114	General Topology	DSC13MAT22	2023-24		CO1: build foundation for future study in analysis, in geometry and in algebraic topology.	
115	Advanced Calculus	DSC13MAT23	2023-24		CO1: Analyze convergence of sequence and series, double sequences and double series	CO2: Analyse convergence of sequences and series of functions.
116	Numerical Analysis II	DSC13MAT24	2023-24		CO4: To check convergence and stability of numerical methods	
117	Number theory	DSE13MAT21	2023-24			CO3: Able to explore basic idea of cryptography.

118	Fuzzy Mathematics	DSE13MAT22	2023-24			CO4: Demonstrate the technologies of fuzzy sets and fuzzy numbers
119	Dynamical System II	DSE13MAT23	2023-24			CO4: Identify the chaotic behaviour in the system by using Lyapunov exponents

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