DEPARTMENT OF <u>MATHEMATICS</u>

Programme Outcomes (PO)
(NEP-2024 Pattern)

PO-01	Enhance their logical thinking and apply advanced mathematical concepts to solve complex problems.
PO-02	Formulate research questions, design experiments or investigations, collect and analyze data and present their findings in a clear and coherent manner.
PO-03	Apply advanced mathematical techniques or tools to analyze and solve challenging problems encountered in mathematics and related fields.
PO-04	Formulate mathematical models that represent real-world phenomena, analyze the models using mathematical methods and interpret the results to make informed decisions or predictions.
PO-05	Develop proficiency in utilizing computational tools, software and programming languages to aid in mathematical analysis, numerical simulations and data visualization.
PO-06	Develop a strong foundation for professional growth and lifelong learning in Mathematics.

Programme Outcomes (PO)

(2019 Pattern)

PO-01	Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study
PO-02	Understand the basic concepts, fundamental principles and scientific theories related to various scientific phenomena and their relevance in the day-to-day life
PO-03	Ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution
PO-04	Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment
PO-05	Understand applications of mathematics in different fields
PO-06	Ability to pursue advanced studies and research in pure and applied mathematical science. Be prepared for life-long learning

Programme Specific Outcomes (PSO)
(NEP-2024 Pattern)

PSO-01	Have a strong foundation for being research in mathematics.
PSO-02	Be able to apply mathematical skills for solving problems.
PSO-03	At least basic knowledge of programming and computational techniques as required for employment.
PSO-04	Formulate and develop mathematical arguments in a logical manner
PSO-05	Capable to analyze the results critically and apply acquired knowledge to solve the problems.
PSO-06	Have at least four different skills and capable to think and communicate in three different languages.
PSO -07	Be able prepare the models for real life problems

Programme Specific Outcomes (PSO)

(2019 Pattern)

PSO-01	Think in a critical manner
PSO-02	Be familiar with different areas of Mathematics
PSO-03	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand
PSO-04	Formulate and develop mathematical arguments in a logical manner
PSO-05	Acquire good knowledge and understanding in advanced areas of mathematics and software like maxima, chosen by the student from the given courses
PSO-06	Be prepared to use Mathematics, not only in the discipline of Mathematics, but also in other disciplines and in their future endeavours
PSO -07	Identify suitable existing methods of analysis, if any, and assess his/her strengths and weaknesses in the context of the problem being considered

DEPARTMENT OF MATHEMATICS CO

Sr. No.	Class	Sem	Subject With Code	CO
1	F.Y.B.Sc. (NEP 2024)	I	MTS-101 : Algebra and Calculus – I	➢ The student will able to know the concept of divisibility in integers. ➢ The student will able to find Greatest Common Divisor of integers using the Euclidean algorithm. ➢ The student will able to understand the concept of Fermat?s theorem and Euler?s phi function. ➢ The student will able to understand the method of finding roots of polynomials and relationship between roots and coefficients of a polynomial. ➢ The student will able to classify real numbers and recognize various properties of real numbers. ➢ The student will able to understand the concept of limit and continuity. ➢ The student will able to draw the graphs of algebraic and transcendental functions considering limits and continuity. ➢ The student will able to apply the concept of limit and continuity for advanced study of different mathematics courses, and in physical, chemical and biological sciences.
2	F.Y.B.Sc. (NEP 2024)	I	MTS: Python-I (SEC-101)	After completion of this course, the student will be able to: ➢ To write python programs and develop a small application. ➢ To develop logic for problem solving. ➢ To be familiar about the basic constructs of programming such as data, operations, con- ditions, loops, functions etc. ➢ To be familiar with string and its operation. ➢ To develop basic concepts of function and terminology. ➢ To determine the methods to create and develop Python programs by utilizing the data structures like lists and tuples.

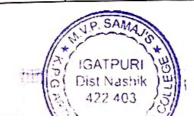| 3	F.Y.B.Sc. (NEP 2024)	I	MTS : Basic Mathematics- I (OE-101)	After completion of this course, the student will be able to: ➤ To understand the concepts of numbers and integers and able to develop skills in basic operations of integers to cultivate the right understanding and regain numerical aptitude. ➤ To understand concepts of H.C.F. and L.C.M. of numbers, square root and cube Root and ability to apply in real-world problems ➤ To understand concepts of ratio, proportion, percentage and be able to cultivate the right understanding regaining numerical aptitude ➤ To understand concepts of average, profit and loss develop a logical approach toward analytical approach to real-world problems ➤ To provide a platform for the students to build the fundamentals of Basic Mathematics for competitive examination preparation strategy ➤ To establish a framework for the students to help acquire the knowledge and expertise necessary to secure employment opportunities in the government sector
4	F.Y.B.Sc Comp.Sci. (NEP 2024)	I	SEC-101-CS-P Statistical Methods for Computer Science I	After completion of the course, student will be able to ➤ Present the complex data in tabular format. ➤ Use various diagrammatic and graphical techniques to represent statistical data and interpret the data. ➤ Compute various measures of central tendency, dispersion, skewness, and kurtosis using MS-Excel and interpret the results ➤ Establish relation between variables and estimate response for given bivariate data using software and interpret the results

5	F.Y.B.Sc Comp.Sci. (NEP 2024)	I	MTC-101-T:Matrix Algebra	➤ Student will be able to work with graphs and identify certain parameters and properties of the given graphs. ➤ Student will be able perform certain algorithms, justify why these algorithms work, and give some estimates of the running times of these algorithms. ➤ Student will be able solve basic exercises of the type: given a graph with properties X, prove that the graph also has property Y. ➤ Student will be able develop an appreciation for the literature on the subject and be able to read and present results from the literature. ➤ Student will be able write cohesive and comprehensive solutions to exercises and be able to defend their arguments.
6	F.Y.B.Sc. (NEP 2024)	II	MTS-101 : Algebra and Calculus – II	➤ Understand the various types of matrices, their properties, and how to convert matrices to echelon form using elementary row operations. ➤ Learn methods to solve systems of linear equations, understand the concept of determinants, evaluate determinants by different methods, and solve problems using properties of determinants. ➤ Apply the concept of matrices and determinant to the problems in chemistry, electronics, cryptography. ➤ Understand differentiation and fundamental theorem in differentiation. ➤ Apply Mean Value Theorems and it's applications ➤ Explore the combined application of algebra and calculus to various mathematical problems.
7	F.Y.B.Sc. (NEP 2024)	II	MTS: Python-II (SEC-151)	This course will enable the students to: ➤ To write python program and develop maps using dictionary ➤ To develop logic for 2D graphics ➤ Demonstrate the use of Python in mathematics such as matrix algebra ➤ To be familiar about basic math builtin functions such as sine, cosine ,etc. ➤ To be familiar with complex numbers ➤ To write Python programs to handle matrices and vectors using NumPy
8	F.Y.B.Sc. (NEP 2024)	II	MTS: Basic Mathematics – II (OE-151)	After completion of this course, the student will be able to: ➤ To understand the concepts of Time, Work and Wages also be able to logical approach towards analytical approach data of real word problem

				> To understand concepts of Linear Equations and ability to solve examples in finding Age in past and future
				> To understand concepts of Simple and Compound Interest and to develop Mathematical Competence.
				> To understand concepts of Mensuration and able to develop Mathematical competence in solving Problems
				> To provide a platform for the students to build the fundamentals of Basic Mathematics for competitive examination preparation strategy.
				> To establish a framework for the students to help acquire the knowledge and expertise necessary to secure employment opportunities in the government sector
9	F.Y.B.Sc Comp.Sci(NEP 2024).	II	MTC-151-T: Graph Theory	> Student will be able work with graphs and identify certain parameters and properties of the given graphs. > Student will be able perform certain algorithms, justify why these algorithms work, and give some estimates of the running times of these algorithms. > Student will be able solve basic exercises of the type: given a graph with properties X, prove that the graph also has property Y. > Student will be able develop an appreciation for the literature on the subject and be able to read and present results from the literature. > Student will be able write cohesive and comprehensive solutions to exercises and be able to defend their arguments.
10	F.Y.B.Sc Comp.Sci. (NEP 2024)	II	SEC-151-CS-P Course Title : Statistical Methods for Computer Science II	After completion of the course, student will be able to > Fit second-degree curve, and exponential curves. > Estimate trends by using time series data. > Understand concept of probability. > Estimate probabilities of standard probability distributions > Perform tests based on normal, Chi-Square, t and F distributions
11	S.Y.B.Sc	III	MT-231-Calculus of Several Variables(23111)	After completion of this course, the student will be able to: > Learn conceptual variations while advancing from one variable to several variables in calculus. > Understand Functions of two variables, Domain and

				> Range, > Graphs, Level Curves, Functions of Three or More Variables, Limits and Continuity. > Applications of multivariable calculus tools in physics, economics, optimization, and understanding the architecture of curves and surfaces in plane and space etc > Understand Partial Derivatives > Learn Higher Derivatives, Clairaut's Theorem, Partial Differential Equations, Wave equation, Chain Rule, Homogeneous Functions, Euler's theorem. > Recognize the major classification of PDEs and the qualitative differences between the classes of equations. > Be competent in solving linear PDEs using classical solution methods > Understand Extreme values of functions of two variables. > Learn Necessary conditions for extreme values, Second Derivative Test, Lagrange Multipliers > Inter-relationship amongst the line integral, double and triple integral formulations. > Sketch curves in Cartesian and polar coordinate systems.
12	S.Y.B.Sc	III	MT-232(A):Numerical Methods & it's applications(23112A)	After completion of this course, the student will be able to: > Obtain numerical solutions of algebraic and transcendental equations. > Learn about various interpolating and extrapolating methods. > Define Basic concepts of operators Δ, E, ∇ > Find the difference of polynomial > Solve problems using Newton forward formula and Newton backward formula. > Derive Newton forward formula and Newton backward interpolation formula. > Apply Lagrange's Interpolation formula whe difference interval are unequal > Understood the concept of Numerical Differentiatic (Derivatives using Newton's forward differen formula) > Apply various numerical methods in real life proble > Derive general quadrature formula > Derive Trapezoidal rule, Simpson's 1/3 and 3/8 rule using general quadrature formula > Solve initial and boundary value problems differential equations using numerical methods. > Find the solution of ordinary differential equation

				first by Taylor's Series method, Picard's method of successive ➤ approximations, Euler method, Modified Euler's methods and Runge-Kutta methods
13	S.Y.B.Sc	III	MT-233:Mathematics Practical(23113)	This course will enable the students to: ➤ Learn Maxima software. ➤ Problem solve on analytic geometry and calculus by using maxima software. ➤ Problem solving on geometry and calculus. ➤ Give the knowledge of geometry using maxima software.
14	S.Y.B.Sc.	IV	MT-241:Linear Algebra (24111)	After completion of this course, the student will be able to: ➤ Solve linear systems (using matrices)by Gauss elimination and Gauss-Jordan elimination method ➤ Understand the concepts of vector spaces, subspaces, bases, dimension and their properties. ➤ Recognize the concepts of the term linear independence, linear dependence, basis, and dimension, and apply these concepts to various vector spaces and subspaces ➤ Understand about Row, Column and Null Space of a matrix, and Rank and nullity ➤ Discuss the linear transformations, properties and equality ➤ Understand the concepts of Kernel and range ➤ State Rank-Nullity theorem ➤ Use matrix algebra and the related matrices to linear transformations ➤ Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations. ➤ Find the characteristic equation, eigen values and eigen vectors of a matrix. ➤ State Cayley- Hamilton theorem ➤ Learn basic Matrix Transformations in R^2 and R^3
15	S.Y.B.Sc.	IV	MT-242(B): Dynamical Systems(24112B)	After completion of this course, the student will be able to: ➤ Students understand the concept of Diagonalisation(matrices with real and distinct eigen values) ➤ Students understand the concept of Logistic Population Model ➤ Students understand the concept First-Order Equations and Planar Linear Systems ➤ Able to find eigenvectors when eigen values are

| 16 | S.Y.B.Sc. | IV | MT-243: Mathematics Practical(24113) | complex
➤ Able to find Exponential of a matrix
➤ Students improve problem solving skills.
➤ Students will cooperate when appropriate to help each other understand the concepts of dynamical systems and to learn how to function in a work.
This course will enable the students to:
➤ To demonstrate used of interpolation method in numerical analysis.
➤ Use computational techniques and algebraic skills essential for the study of systems of Linear equations, matrix algebra, vector spaces, eigen values and eigenvectors, Orthogonality and Diagonalization |

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