

BA Programme (with Mathematics as discipline)

Programme Outcomes (PO):

A student opting for mathematics along with other humanity disciplines is able to:

- Solve problems using a broad range of significant mathematical techniques, including calculus, algebra, geometry, analysis, numerical methods, differential equations, probability and statistics along with hands-on learning through CAS and LaTeX.
- Construct, modify and analyze mathematical models of systems encountered in disciplines such as economics, psychology, political sciences and sociology, assess the models' accuracy and usefulness, and draw contextual conclusions from them.
- Use mathematical, computational and statistical tools to detect patterns and model performance.
- Choose appropriate statistical methods and apply them in various data analysis problems.
- Use statistical software to perform data analysis.
- Have fundamental research design and mathematical/statistical skills needed to understand the acquired discipline specific knowledge.

Course Outcomes (CO):

ELEMENTS OF DISCRETE MATHEMATICS:

Learning outcomes This course will enable the students to:

- Understand the basic concepts of sets, relations, functions, and induction.
- Understand mathematical logic and logical operations to various fields.
- Understand the notion of order and maps between partially ordered sets.
- Minimize a Boolean polynomial and apply Boolean algebra techniques to decode switching circuits.

TOPICS IN CALCULUS:

Learning Outcomes This course will enable the students to:

- Understand continuity and differentiability in terms of limits and graphs of certain functions.
- Describe asymptotic behaviour in terms of limits involving infinity.
- Use of derivatives to explore the behaviour of a given function locating and classify its extrema and graphing the function.
- Apply the concepts of asymptotes, and inflexion points in tracing of cartesian curves.
- Compute the reduction formulae of standard transcendental functions with applications.

ANALYTIC GEOMETRY:

Learning Outcomes: This course will enable the students to:

- Learn concepts in two-dimensional geometry.
- Identify and sketch conics namely, ellipse, parabola and hyperbola.
- Learn about three-dimensional objects such as straight lines and planes using vectors, spheres, cones and cylinders.

Elementary Linear Algebra:

Learning Outcomes: This course will enable the students to:

- Visualize the space \mathbb{R}^n in terms of vectors and the interrelation of vectors with matrices.
- Familiarize with concepts of bases, dimension and minimal spanning sets in vector spaces.
- Learn about linear transformation and its corresponding matrix.

Computer Algebra Systems:

Course Learning Outcomes: This course will enable the students to:

- i) Use CAS as a calculator and for plotting functions.
- ii) Understand the role of CAS finding roots of polynomials and solving general equations.
- iii) Employ CAS for computing limits, derivatives, and computing definite and indefinite integrals.
- iv) Use CAS to understand matrix operations and to find eigenvalues of matrices.

Analytic Geometry and Applied Algebra:

Course Learning Outcomes: The course will enable the students to:

- i) Learn concepts in two-dimensional geometry.
- ii) Identify and sketch conics namely, ellipse, parabola and hyperbola.
- iii) Learn about three-dimensional objects such as spheres, conicoids, straight lines and planes using vectors.
- iv) Understand various applications of algebra in design of experiments, modelling of matching jobs, checking spellings, network reliability and scheduling of meetings.

Analysis:

Course Learning Outcomes: The course will enable the students to:

- i) Understand basic properties of the field of real numbers.
- ii) Examine continuity and uniform continuity of functions using sequential criterion.
- iii) Test convergence of sequence and series of real numbers.
- iv) Distinguish between the notion of integral as anti-derivative and Riemann integral.

Mathematical Typesetting System: LaTeX:

Course Learning Outcomes: This course will enable the students to:

- i) Create and typeset a LaTeX document.
- ii) Typeset a mathematical document using LaTeX.
- iii) Learn about pictures and graphics in LaTeX.
- iv) Create beamer presentations.

Transportation and Network Flow Problems:

Course Learning Outcomes: This course will enable the students to:

- i) Formulate and solve transportation problems.
- ii) Learn to solve assignment problems using Hungarian method.
- iii) Solve travelling salesman problem.
- iv) Learn about network models and various network flow problems.
- v) Learn about project planning techniques namely, CPM and PERT.

Statistics:

Course Learning Outcomes: The course will enable the students to:

- i) Determine moments and distribution function using moment generating functions.
- ii) Learn about various discrete and continuous probability distributions.
- iii) Know about correlation and regression for two variables, weak law of large numbers and central limit theorem.
- iv) Test validity of hypothesis, using Chi-square, F and t-tests, respectively in sampling distributions.

Statistical Software: R:

Course Learning Outcomes: This course will enable the students to:

- i) Be familiar with R syntax and use R as a calculator.
- ii) Understand the concepts of objects, vectors and data types.
- iii) Know about summary commands and summary table in R.
- iv) Visualize the distribution of data in R and learn about normality test.
- v) Plot various graphs and charts using R.

Numerical Methods:

Course Learning Outcomes: After completion of this course, students will be able to:

- i) Find the consequences of finite precision and the inherent limits of numerical methods.
- ii) Appropriate numerical methods to solve algebraic and transcendental equations.
- iii) Solve first order initial value problems of ordinary differential equations numerically using Euler methods.