

# **COURSE, PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES OF MATHEMATICS**

## **Programme Outcomes:**

**PO1:** Students will be able to develop scientific temperament.

**PO2:** Students will be able to acquire basic skills & technical knowledge.

**PO3:** Students will be eligible for career opportunities.

**PO4:** Students will be able to possess basic subject knowledge required for higher studies, professional and applied courses like Management Studies, Law etc. and research institutes.

**PO5:** Students will be able to develop solution oriented approach towards various social and environmental issues.

## **Programme Specific Outcomes:**

**PSO1:** Students will have strong foundation in the fundamental, application, scientific theories and should be able to recall basic facts, notations, and terminology.

**PSO2:** Students will be equipped with modeling ability, problem solving skills, creative talent, and communication skills required for various kinds of employment.

**PSO3:** Students will be able to apply their mathematical skills in various fields, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

**PSO4:** Students will be able to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

**PSO5:** Students will develop skills in problem solving, critical thinking and analytical reasoning to scientific problems.

**PSO6:** Students will be able to pursue higher studies in science subjects.

**PSO7:** Students will be able to qualify different competitive exams where essential qualifications are graduation.

**\*Unit wise course outcomes of UG Semester I (Fundamental mathematics)**

It will give basic knowledge and background to understand other courses either in mathematics or physics.

<b>Unit I</b>	<ul style="list-style-type: none"><li>• Students will learn basic properties of real numbers and its sets and subsets which is backbone of Real Analysis.</li><li>• Students will learn various types of sets and relations, and its concepts.</li></ul>
<b>Unit II</b>	<ul style="list-style-type: none"><li>• Students will learn relation between roots and coefficients of algebraic equation.</li><li>• Students will learn transformation of equation, Descartes rule of signs and will be able to find solution of cubic and biquadratic equations.</li></ul>
<b>Unit III</b>	Students will learn basics of matrices and its algebra, method to find solutions to system of linear equations, Eigen values and eigenvectors of matrix.
<b>Unit IV</b>	<ul style="list-style-type: none"><li>• Students will learn trigonometrical concepts and will learn summation of trigonometrical series by various methods.</li><li>• 2. Students will be able to solve problems containing trigonometrical functions in other areas of study especially physics and engineering.</li></ul>
<b>Unit V</b>	Students will get detailed knowledge of vectors and scalars, its applications and many theorems which will help them solve many problems based on differentiation and integration.

**\* Unit wise Course Outcomes of Semester II (Geometry)**

1. It will enhance the understanding of mathematical concepts with geometrical/graphical interpretations.

2. On completion of this course, students will be able to visualize mathematical concepts geometrically.

<b>Unit I</b>	Students will learn basic concepts of Polar coordinates system, Polar equation and its applications, and tracing of curves.
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<b>Unit II</b>	Students will learn Cartesian co-ordinates in 3D. They will learn forming various forms of equations of plane.
<b>Unit III</b>	They will learn about straight lines and the sphere.
<b>Unit IV</b>	Students will learn basic as well as advanced concepts in cones and cylinder.
<b>Unit V</b>	Students will learn about the conicoids.

### Unit wise Course Outcomes of UG II year

#### **Paper I (Higher and Abstract Algebra)**

1. Students will get detailed knowledge of transformation of equation, Decarte's Rule, Group theory, Ring theory etc. .
2. It relates and gives an analytical aptitude for various mathematical problems.
3. On completion of this course, students will be able to apply these concepts in other areas of study .

<b>Unit I</b>	Students will learn basic concepts of Transformation of equation, Decarte's rule, solution of cubic & biquadratic equations, convergence and divergence of sequence and serie .
<b>Unit II</b>	Students will learn about Groups and the related properties .They will also learn about cyclic groups, Permutation groups, subgroups Homomorphism, Isomorphism, normal sub groups and will be able to apply these.
<b>Unit III</b>	Students will study about rings and their properties.

#### **Paper II (Differential Equation)**

1. Students will get detailed knowledge of differential equations and their solutions.
2. On completion of this course, students will be able to solve mathematical problems in daily life.
3. On completion of this course, students will be able to understand and solve typical problems of physics and other related areas.

<b>Unit I</b>	<ul style="list-style-type: none"> <li>• Students will get detailed knowledge of differential equations and their solutions.</li> <li>• Students will learn the application of Ordinary differential Equations through method to find Orthogonal Trajectories.They will also study about initial and boundary value problems and their application.</li> <li>• They will learn methods to solve first order Partial Differential Equations.</li> </ul>
<b>Unit II</b>	They will learn methods to solve linear differential equations with constant coefficient, Simultaneous Differential Equations, Exact Differential equation ,and Total differential equation. They will learn methods to solve linear differential equation of second order with variable coefficient.
<b>Unit III</b>	<ul style="list-style-type: none"> <li>• They will learn methods to solve first order Partial Differential Equations Charpit' method.</li> <li>• They will learn methods to solve linear Partial Differential Equations with constant coefficient.</li> </ul>

### **Paper III (Statics and Dynamics)**

<b>Unit I</b>	Students will study about centre of gravity in two and three dimension, common catenary, virtual work, and forces in 3D.
<b>Unit II</b>	Students will study about kinematics, rectilinear motions, and motions in resting medium, central orbits, constrained motion, moment and product of inertia.

### **Course Outcomes of UG III year**

#### **Paper I (Linear Algebra and Linear programming)**

1. Students will be able to understand the concepts of vector space and subspace.
2. Students will be able to get better understanding of other subjects, especially certain concepts of physics.

<b>Unit I</b>	Students will be able to understand the concepts of vector space, subspace , linear combination , linear spans, linear sum, sum and direct sum ,Linear dependence, basis
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	and dimensions .It will enhance thinking of students.
<b>Unit II</b>	Students will study about linear transformation, rank and nullity, linear operator ,matrix of linear transformation and matrix of linear operator, change of basis.
<b>Unit III</b>	Students will study about linear functional, dual space , dual basis, annihilators, transpose of linear transformation, bilinear, quadratic and Hermitian form quadratic form.
<b>Unit IV</b>	Students will study about Programming, graphical method ,simplex method and dual method of linear programming.

### **Paper II Analysis**

1. After completing this course, the students will be able to understand the theory used to solve the mathematical problems.
2. This course will enhance the critical thinking of the students.
3. The core concepts of Analysis (Real and complex) have been included in this course with a view that students can understand the behavior of real/complex numbers in a critical manner.
4. Students will be able to learn basic techniques and examples in analysis to be well prepared for courses like Topology, Measure theory and Functional analysis.
5. Students will learn basic algebraic properties of complex numbers and limit and continuity of complex functions.
6. Students will learn analytic functions and the C-R equations and its necessary and sufficient conditions.
7. Students will learn various methods useful in finding integration of complex valued functions.

<b>Unit I</b>	Students will get deep knowledge of continuity and its types, types of discontinuities, uniform continuity and differentiability, Taylor theorem with various forms of remainder, Riemann integral, condition of integrability, convergence and uniform convergence of improper integrals, pointwise convergence, uniform convergence, test of uniform convergence, convergence and uniform convergence of sequence and series.
<b>Unit II</b>	Students will study about functions of complex variables , Harmonic function, C-R equations, analytic functions ,complex integration, Cauchy's theorem , Cauchy's integral formula, Taylor's series ,Laurent's series, Liouville's series, Poles and singularities , Residues ,Residue theorem its applications and evaluationof integrals.

### **Paper III (Numerical analysis)**

1. After completing this course, the students will be able to understand the theory used to solve the mathematical problems.
2. This course will enhance the critical thinking of the students.
3. After completion of this course, the students will be able to understand the methods to find alternate/ approximate solutions of certain mathematical problems.
4. Students will learn to apply the various numerical techniques for solving real life problems.
5. Students will learn to find solution of the problems, which cannot be solved by usual formulae and methods, approximately by using numerical techniques.

<b>Unit I</b>	<ul style="list-style-type: none"> <li>• Students will learn to solve the problems based on finite difference, difference operator, Newton's interpolation method, divided difference, interpolation with unequal interval of arguments, Lagrange's formula Sterlingsand Bessl's formula.</li> <li>• They will also learn numerical differentiation ,numerical integration , Simpson's rule, Trapezoidal rule, Regula-Falsi ,Newton Raphson, Graff's root squaring method ,Numerical method of matrix inversion Determination of Eigen values and Eigen vectors.</li> </ul>
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