GIRRAJ GOVT.COLLEGE (A), NIZAMABAD

DEPARTMENT OF MATHEMATICS

UG PROGRAM OUTCOMES (CBCS)

The outcome of the mathematics degree programs (**M.P.CS, M.S.CS, M.S.DS**, **and M.P.C**) is to equip students with analytic and problem solving skills for careers and graduate work. Classes develop student abilities and aptitudes to apply mathematical methods and ideas not only to problems in mathematics and related fields such as the sciences, computer science, actuarial science, or statistics.

Students are encouraged to develop intellectually and to become involved with professional organizations.

For example:

1. Demonstrate basic manipulative skills in algebra, geometry, and beginning calculus.

2. Apply the underlying unifying structures of mathematics (i.e. sets, relations and functions, logical structure, real analysis, etc.) and the relationships among them.

3. Demonstrate proficiency in writing proofs.

4. Communicate mathematical ideas both orally and in writing.

5. Investigate and solve unfamiliar math problems Individuals who have completed a degree in mathematics should be equipped to

(i) Find employment utilizing their mathematical knowledge.

(ii) Use their mathematical knowledge to solve problems.

(iii) Undertake further studies related to mathematics. Based on these over-arching objectives, a set of program outcomes has been adopted which describe the skills, knowledge, attitudes, values and behaviours that students should be able to demonstrate by the time they complete the program.

PROGRAM SPECIFIC OUTCOMES (CBCS)

Program specific outcomes, which will:

• be well grounded in the basic manipulative skills level of algebra, geometry, Linear Algebra, Real Analysis and beginning level calculus.

• be develop an understanding of the underlying unifying structures of mathematics (i.e., sets, relations and Real functions, logical structure, Problems, etc.) and the relationships among them.

• be able to transmit mathematics ideas both orally and in writing.

• be develop the ability to read and learn mathematics on their own.

• Such maturity is a much a function of how mathematics is learned as it is of what mathematics is learned

COURSE OUTCOMES

S.NO	COURSE& SEM	OUT COMES
01	Differential Calculus (SEM-I)	By the time students completes the course they realize wide ranging applications of the subject
02	Differential Equations (SEM-II)	After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.
03	Real Analysis (SEM-III)	After the completion of the course students will be in a position to appreciate beauty and applicability of the course.
04	Algebra (SEM-IV)	On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.
05	Linear Algebra (SEM-V)	After completion this course students appreciate its interdisciplinary nature.
06	Solid Geometry (SEM-V)	Students understand the beautiful interplay between algebra and geometry.

07	Numerical Analysis (SEM-VI)	Students realize the importance of the subject in solving some problems of algebra and Calculus
08	Vector Calculus (SEM-VI)	Students realize the way vector calculus is used to addresses some of the problems of Physics
09	Theory of Equations (SEC)	By using the concepts learnt the students are expected to solve some of the polynomial Equations
10	Mathematical Modelling	The focus is on those Mathematical techniques that are applicable to models involving Differential equations which describe rates of change. Student realizes some beautiful problems can be modelled by using Differential equations .The Students also learn how to use the Mathematical techniques in solving Differential equations

PG PROGRAM OUTCOMES (CBCS)

SEMESTER-I

PAPER	COURS OUTCOMES
MATH101 ABSTRACT ALGEBRA	**At the end of the course student will be able to:** → Understand and apply knowledge of basic set theory, mappings, properties of integers, and mathematical induction. → State and apply Lagrange's theorem, Isomorphism theorems, and the homomorphism theorems. → Distinguish the similarities and differences among various types of groups. → **Learn Group and subgroup, Normal subgroup Quotient Groups and permutation Groups with example and with its application** → **learn G-sets, cayleys theorem,sylows theorem with its application** → Identify and compare the properties of rings, ideals, quotient rings, integral domains, principal ideal domains, unique factorization domains, and fields. → Investigate various properties of factor groups and direct products.
MATH102 REAL ANALYSIS	**At the end of the course student will be able to:** → **Determine basicTopological,Connectedness and Compactness properties of subsets of the Real numbers and prove a selection of related theorems**

	→ **Define the Limit of a sequence, series and the cauchys criterion** → **Determine the continuity, Uniform continuity and point wise continuity of a function and analyze the relation between them** → Ability to acquire knowledge of Convergence series. → **Define Derivatives of a functions** → Able to understand Differentiations and Integrations and their applications. → **Prove the Bolzano-weierstrass theorem,Rolles theorem,Extream value theorem and the mean value theorem**
MATH103 T-TOPOLOGY	**At the end of the course student will be able to:** → Define topological spaces, product topology, metric topology, quotient space. → Discuss the continuous functions, connected space, compact space, complete → Metric space, related theorems on Baire space. → Describe closed sets and limit points, components and path components. → Prove Urysohn's lemma, Urysohn's metrization theorem, Nagata-Snirnov Metrization theorem, Ascoli's theorem. → Understand the separation axiom, a space filling curve.
MATH104 T-ELEMENTARY NUMBER THEORY	**At the end of the course student will be able to:** → **Prove results involving divisibility and greatest common divisors;** → **Solve systems of linear congruence's;**

	→ **Find integral solutions to specified linear Diophantine Equations;** → **Apply Euler-Fermat's Theorem to prove relations involving prime numbers;** → **Apply the Wilson's theorem.** → Discuss the function of Mobius, Euler function → Define divisibility, greatest common divisor, Prime numbers, congruence, Dirichlet convolution, generalized convolution, Quadratic residues. → Prove fundamental theorem of Arithmetic → Derive Euler Summation formula, Elementary asymptotic formula, Dirichlet inversion formula, Mobius inversion formula, Gauss lemma**.**
MATH105 MATHEMATICAL METHODS	**At the end of the course student will be able to:** → Demonstrate familiarity with emerging mathematical techniques appropriate in → banks and other financial institutions → **Demonstrate an ability to select and apply numerical methods appropriate for** → **The solution of financial problems.** → **The principles of mathematical reasoning and their use in understanding analyzing and developing formal arguments.** → **The connections between the mathematical series and other scientific and humoristic disciplines.** → **Undertake a piece of directed in mathematical finance.**

SEMESTER-II

PAPER	COURS OUTCOMES
MATH201 ADVANCED ALGEBRA	At the end of the course student will be able to: → Explain the fundamental concepts of advanced algebra and their role in modern Mathematics and applied contexts. → Define the polynomial ring, reducible polynomial and, Find the roots and the derivatives of a irreducible polynomial → Define Ring, Field, Extension Field, Euclidean Rings, Polynomial Rings and Vector Space with examples → Discuss the symmetric function, normal extension, splitting field, Galois Group with example and its application → Prove the fundamental theorem of Galois theory and fundamental theorem of algebra → Explain Demonstrate accurate and efficient use of advanced algebraic techniques. → Demonstrate capacity for mathematic reasoning through analyzing, Proving and explaining concepts from advanced algebra. → Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and other mathematics branches
MATH202 ADVANCED REAL ANALYSIS	At the end of the course student will be able to: → Read analyze and write logical arguments to prove mathematical concepts → Communicate mathematical ideas with clarity and coherence both written and verbally → Fundamental objects ,techniques and theorems in the mathematical sciences

	including the fields of analysis → Master the object material in the four required core course that form the academic pillars of the program → Demonstrate a competence in formulating , analyzing and solving problems in several core areas of mathematics at a detailed level , including analyzing
MATH203 FUNCTIONAL ANALYSIS	At the end of the course student will be able to: → Recognize inner product spaces → Identify duals of some normed spaces → Explain the normed space which is not an inner product space → Identify orthogonal and orthonormal sets → Understand the notion of orthogonal complement and the decomposition of space → Explain main theorem of normed space → Explain Hahn –Banach theorem → Explain open mapping theorem → Explain closed graph theorem
MATH204 THEORY OF ORDINARY DIFFERENTIAL EQUATION	At the end of the course student will be able to: → The study of Differential focuses on the existence and uniqueness of solutions and also emphasizes the rigorous justification of methods for approximating solutions in pure and applied mathematics. → It plays an important role in modelling virtually every physically technical or biological process from celestial motion to bridge design to interactions between neurons. → Theory of differential equations is widely used in formulating many fundamental laws of physics and chemistry. → Theory of differential equation is used

	in economics and biology to model the behaviour of complex systems. → Differential equations have a remarkable ability to predict the world around us. → They can describe exponential growth and decay population growth of species or Change in investment return over time.
MATH205 DISCREATE MATHEMATICS	→ At the end of the course student will be able to: → Understand the basic principles of sets and operations in sets → Apply counting principles to determine probabilities → Demonstrate different traversal methods for trees and graphs → Write model problems in computer science using trees and graphs → Write an argument using logical notation and determine if the argument is or is not Valid

PAPER	SEMESTER- III COURSE OUTCOMES
MATH301 COMPLEX ANALYSIS	At the end of the course student will be able to: → Recognize the concept of limits, continuity, Differentiability and analytic function → Test the analyticity of a given function. → Prove the Lucas's theorem, Abel's theorem and Cauchy's Theorems. → Discuss conformality, linear transformation, singularities, types of singularities and Residues
MATH302 ELEMENTARY OPERATOR THEORY	At the end of the course student will be able to: → Prove the continuity of concrete linear operators between logical vector spaces → Give a linear operator,understand weather or not compact → Find the essential spectra of linear operators → Find the maximal spectra of concrete communicative Banach algebra → Describe the functional calculii and the spectral decomposition of concrete self adjointt operator
MATH303 OPERATION RESEARCH	At the end of the course student will be able to: → Operation Research is used for defence capability acquisition decision making. → It is used to find optimal or near optimal solutions to complex decision making problems. → It is used in finding maximum (of profit or yield) in real-world objective. → It is used in finding minimum (of loss or cost) in real-world objective. → It is used in data envelopment. → It has strong ties to computer science and analytics.

MATH304 INTEGRAL EQUATION	At the end of the course student will be able to: → Explain the integral equation → Explain linear Fredholm and Voltera integral equation → Convert integral equation into differential equation → Convert differential equation into integral equation → Solve fredholm integral equation → Solve fredholm integral equation by using the method of successive approximation → Solve volleterra integral equation → Solve integral equation with constant and degenerate kernel
MATH305 ALGEBRAIC NUMBER THEORY	At the end of the course student will be able to: → Define divisibility, greatest common divisor, Prime numbers, congruence, Dirichlet convolution, generalized convolution, Quadratic residues. → Prove fundamental theorem of Arithmetic → Compute greatest common divisor of two numbers, more than two numbers → Discuss the function of Mobius, Euler, Lioville, Mangolt, the divisor. → Apply Chinese Remainder theorem, → Explain Diophantine equation → Derive Euler Summation formula, Gauss lemma → Synthesize the main concepts of algebraic number theory. → Solve problems related to algebraic number theory → The concept of algebraic numbers and

	algebraic integers → How to factorizean algebraic integer into irreducibles → How to finds ideal of algebraic number ring → The definition of the class group

SEMESTER-IV

PAPER	COURS OUTCOMES
MATH401 ADVANCED COMPLEX ANALYSIS	At the end of the course student will be able to: → Prove the local mapping theorem, maximum modulus principle, Residue theorem. → Evaluate the integral using Cauchy's integral formula and Residue theorem. → Find the Taylor's and Laurent's series expansion of given function → Show Jensen's formula
MATH402 GENERAL MEASURE THEORY	At the end of the course student will be able to: → Students will understand the fundamentals of measure theory and be acquainted with the proofs of the fundamental theorems underlying the theory of integration. → They will also have an understanding of how these underpin the use of mathematical concepts such as volume, area, and integration → They will develop a perspective on the broader impact of measure theory in ergodic theory and have the ability to pursue further studies in this and related area. → The students will learn about measure theory random variables, independence expectations and conditional expectations, product measures and discrete parameter matingalus. → Explain the concept of length, area, volume using lebesgue's theory. → Apply the general principles of measure theory and integration in such concrete subjects as the theory of probability or financial

	mathematics.
MATH403 ADVANCED OPERATION RESEARCH	At the end of the course student will be able to: → Give an appreciation of strategic importance of operations and supply chain management in a global business environment. → Understand how an operation relates to other business function. → Develop a working knowledge of concepts and methods related to designing and managing operations and supply chains. → Develop a skill set for quality and process improvement. → Develops how to manage and control the resource allocation
MATH404 BANACH ALGEBRA	At the end of the course student will be able to: → Correlate Functional analysis to problems arising in Partial Differential equation, Measure Theory and other branches of mathematics → Prove the spectral theorems → Prove the spectral mapping theorem on normal operator on Hilbert Space → Exposed to many ideas and tools that are useful in other branches of analysis and mathematical physics, Including spectrum, commutative Banach algebras → Define the Gelfand transformation ,$C^{\times}$-Algebra and their representations → Prove the Gelfand Naimark Theorem
MATH405 CALCULAS OF VARIATION	At the end of the course student will be able to: → Learn variation principles → Develop the knowledge in the path of the rocket trajectory, optimal economic growth

	→ Gain the vast knowledge by using the applications of calculus of variations in biological and medical field. • Ex: Spread of a contagious disease, pest control cancer chemotherapy and immune system, etc. → Learn easier & systematic way to ordinary and differential equations and partial differential equations → Develop the skills while doing/solving the various problems by using integral equations in all engineering sciences and etc.