

DEPARTMENT OF MATHEMATICS

PROGRAMME SPECIFIC OUTCOMES

Students of B.Sc. with major in mathematics should

- Understand the limit of functions, use to prove properties of continuous functions and derivative of functions
- Derive methods for various mathematical operations and tasks such as interpolation, differentiation and integration

TARA GOVERNMENT COLLEGE (A) SANGAREDDY

COURSES AND THEIR OUTCOMES

DEPARTMENT OF MATHEMATICS

SEMESTER-1: COURSE(DIFFERENTIAL CALCULUS)-5 CREDITS

- CO1:** The course is aimed at exposing the students to some basic notations in differential calculus.
- CO2:** Students can visualize the two variable functions and able to find the partial derivatives of two variable functions
- CO3:** Students will learn how to apply concepts of maxima and minima of functions of two variables in real life
- CO4:** Students can understand the concepts of curvature, evolutes and involutes and able to find the same for Various popular curves.
- CO5:** Students can find the lengths of various curves and Volumes and Surfaces of Revolution

SEMESTER-2: COURSE(DIFFERENTIAL EQUATIONS)-5 CREDITS

- CO1 The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.
- CO2 After learning the course the students will be equipped with the various tools to solve few types of differential equations that arise in several branches of science.
- CO3 Students will be able to solve Differential Equations of first order and first degree.
- CO4 Students can find integrating factors to make certain kinds of Differential Equations exact and thereby solve the equations.
- CO5 Students will be able to solve Differential Equations first order but not of first degree.
- CO6 Students can formulate mathematical models in the form of ordinary differential equations to suggest possible solutions of the day to day problems like Growth and Decay, Dynamics of Tumour Growth, Radioactivity and Carbon Dating, Compound Interest and Orthogonal Trajectories arising in physical, chemical and biological disciplines.
- CO7 Students will be able to solve Higher order Linear Differential Equations
- CO8 Students can form and solve Partial Differential Equations

SEMESTER-3: COURSE(REAL ANALYSIS) - 5 CREDITS

- CO1 The course is aimed at exposing the students to the foundations of analysis which will be useful in Understanding various physical phenomena
- CO2 After the completion of the course students will be in a position to appreciate beauty and applicability of the course
- CO3 Students can recognize bounded, convergent, divergent, Cauchy and monotonic sequences and can calculate their limit superior, limit inferior and the limits of convergent sequences.
- CO4 Students can apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers and able to find the sum of infinite terms of some convergent series.
- CO5 Students can identify Continuous and Uniformly Continuous Functions
- CO6 Students can understand the properties of Continuous Functions

- CO7 Students can find the limits of functions
- CO8 Students can understand Basic Properties of the Derivatives
- CO9 Students can understand the Mean Value Theorem, L'Hospital Rule and Taylor's Theorem and their applications.
- CO10 Students can understand the concept of Riemann Integration.
- CO11 Students can understand the Properties of Riemann Integral.
- CO12 Students can understand the applications of the fundamental theorems of integration.

SEMESTER-4: COURSE(ABSTRACT ALGEBRA) -5 CREDITS

- CO 1 The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.
- CO2 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.
- CO3 Students can understand the concept of algebraic structures Groups, Subgroups and identify Groups, Subgroups.
- CO4 Link the fundamental concepts of groups and symmetries of geometrical objects.
- CO5 Students can Classify Subgroups and Cyclic Groups
- CO6 Students can understand Permutation Groups and Properties of Permutations
- CO7 Students can understand the notions of cosets, normal subgroups, and factor groups.
- CO8 Students can analyze consequences of Lagrange's theorem.
- CO9 Learn about structure preserving maps between groups and their consequences.
- CO10 Students can understand the concepts of Rings, Integral Domains, Ideals, Factor Rings, Prime Ideals, Maximal Ideals and Ring Homomorphisms
- CO11 Students will learn important applications of groups like check digit systems which is applied in bank Notes serial numbers.
- CO12 Students can able to understand Modular arithmetic, which is vital in cryptography.

SEMESTER-5: COURSE(LINEAR ALGEBRA)- 5 CREDITS

- CO1 Students can understand the concepts of vector spaces, subspaces, bases, dimension and their properties, Coordinate Systems which play key role in digitalization.
- CO2 Students can find the solution space of homogeneous equations using Null space
- CO3 Students can map Vector Spaces through order preserving linear transformations.
- CO4 Students can find the rank of matrices, which has many applications in solving system of equations
- CO5 Students can understand the relation between Coordinates when basis are changed.
- CO6 Students can find Eigenvalues and Eigenvectors of matrices, which has many applications
- CO7 Students can understand the Diagonalization process, which reduces huge computing tasks and has Applications in real time calculations.

- CO8 Students can learn properties of inner product spaces and determine orthogonality in inner product Space.
- CO9 Students can realize the power of matrices and their role in digitalization.

SEMESTER-5: COURSE (INTEGRAL CALCULUS)-4 CREDITS

- CO1 Students will be able to use various techniques of evaluating multiple integrals.
- CO2 Students will be able to find the Double Integrals over a Rectangle
- CO3 Students will be able to find the Double Integrals over General Regions in the Plane
- CO4 Students will be able to apply the concepts in finding areas and volumes of some solids.
- CO5 Students will be able to find the Integrals over a Box
- CO6 Students will be able to find the Integrals over Elementary Regions in Space
- CO7 Students will learn evaluation of multiple integrals by changing variables

DSE-VI(A)SEMESTER-6: COURSE(NUMERICAL ANALYSIS) -5 CREDITS

- CO1 Students will be able to find the solutions of all algebraic and transcendental equations in one variable with desired accuracy using various methods.
- CO2 Students will be able to convert the data in to polynomials using various methods.
- CO3 Students will be able to interpolate the data with in the given intervals.
- CO4 Students will be able to understand various methods of Numerical Differentiation
- CO5 Students will be able to understand various methods of Numerical Integration
- CO6 Students can apply various numerical methods to get results in numerical form which are useful in real life problems.

DSE-VI(B)SEMESTER-6: COURSE(INTEGRAL TRANSFORMS) -5 CREDITS

- CO1 In this course, Students learn various methods to find the Laplace transform of a function.
- CO2 Students will learn various methods to find inverse Laplace transforms.
- CO3 Students will get to know the application of Laplace transform in solving ordinary and partial differential Equations.

DSE-VI(C)SEMESTER-5,COURSE(ANALYTICAL SOLID GEOMETRY),5 CREDITS

- CO1 Students learn to describe some of the surfaces by using analytical geometry.
- CO2 Students understand the beautiful interplay between algebra and geometry.
- CO3 Students can understand and visualize three dimensional objects like plane ,sphere, cone, Cylinder and conicoids. Students can do solutions for problems involving these shapes.

SEC-IV-SEMESTER-IV,COURSE(VECTOR CALCULUS-2 CREDITS

- CO1 Concepts like gradient, divergence, curl and their physical relevance will be taught
- CO1 Students can realize the way vector calculus is used to addresses some of the problems of physics
- CO2 Students can evaluate Line integrals
- CO3 Students can evaluate Surface integrals
- CO4 Students can evaluate Volume integrals

- CO5 Students can find Gradient of a scalar field
- CO6 Students can find Divergence of a vector field
- CO7 Students can find curl of a vector field
- CO8 Students can understand the concepts of rotational and irrotational vectors, which have importance in meteorological centers.

SEC-I-SEMESTER-I(THEORY OF EQUATIONS) -2 CREDITS

- CO1 Students can use various tools to solve quadratic, cubic, biquadratic and quintic equations.
- CO2 Students can able to identify the number of possible positive, negative roots of a polynomial equation using Descartes Rule of Signs.
- CO3 Students can learn the relation between roots and coefficients of a polynomial equation
- CO4 Students can understand the symmetric functions of roots

SEC-II-SEMESTER-III(LOGIC AND SETS) -2 CREDITS

- CO1 Students learn some concepts of set theory and logic
- CO2 Students are able to learn truth tables
- CO3 Student will get knowledge on axiomatic approach of probability
- CO4 With the laws learned in this , student can do proof of theorems in scientific manner
- CO5 Main out come of the course is students appreciates its importance in the development of computer science.

SEC-III-SEMESTER-IV(NUMBER THEORY) -2 CREDITS

- CO1 Students will be exposed to some of the important theorems like Fermat's theorem, Euler's theorem and they can apply these theorems in doing some problems in number theory
- CO2 Students will learn What is Goldbach conjecture and Mobius inversion formula
- CO3 Students can understand Basic properties of Congruences and can apply these properties to solve problems like when divided by then what will be the remainder?
- CO4 Students will learn about phi function and its importance.
- CO5 Student can apply the knowledge acquired to solve divisor problems

GENERIC ELECTIVE-V-A (BASIC MATHEMATICS)-4 CREDITS

- CO1 By learning this course, students can understand the basic concepts of cartesian coordinate system like distance formula, section formula, centroid of a triangle and area of a triangles
- CO2 Students will learn about straight lines in analytical form and formulas related to them
- CO3 Students can understand about matrices and different types of matrices
- CO4 Students will learn invertibility of matrices and they can find inverse of given matrices using determinant and adjoint
- CO5 Students can solve system of linear equations which arising in real time situation. Knowledge gained here is helpful in writing computer program in solving systems.

GENERIC ELECTIVE-V-A (MATHEMATICS OF FINANCE AND INSURANCE)-4 CREDITS

- CO1 Students can do analysis of demand and supply using system of linear equations
- CO2 Students can understand how to draw the graphs of quadratic functions and they can use these graphs to analyze economic parameters.
- CO3 Student will get the knowledge how the exponential, logarithmic functions arise in production of goods.
- CO4 Apart from learning matrices students get the knowledge of solving linear equations which arise in economics
- CO5 Students will learn new concept like Difference equations

OPTIONAL (MATHEMATICAL MODELLING)-4 CREDITS

- CO1 The focus will be on those mathematical techniques that are applicable models involving differential equations
- CO2 Student can understand population growth models, microbial growth and radioactive decay models Through differential equations.
- CO3 Students will learn different types heat transfers and laws involved in heat transfers, like Fourier's law of heat conduction
- CO4 Students can understand influenza outbreaks models' and prey predator models
- CO5 This course will give a knowledge how partial differential equations can be used to study heat conduction in objects.
- CO6 This course will impart knowledge of lake pollution models.

PROGRAM SPECIFIC OUTCOMES of B.Sc. (Mathematics)

- PSO1 : Disciplinary knowledge: Students will have the capability of demonstrating comprehensive knowledge of Mathematics and two more disciplines of Sciences which form a part of an undergraduate program of study.
- PSO2 : Analytical reasoning: The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning, which can be utilized in modeling and solving real life problems.
- PSO3 : Problem solving: Students will have the capability to solve various problems using the domain knowledge of mathematics acquired during this program.
- PSO4 : Research-related skills: Students will have the Capability for inquiring about appropriate questions relating to the concepts in various fields of Sciences and acquainted with the advances in various branches of Sciences.
- PSO5 : Moral and ethical awareness/reasoning: Students will have the ability to identify unethical behavior such as fabrication, falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in all aspects.
- PSO6 : Self-directed learning: Students will have the ability to work independently and do in-depth study of various notions of mathematics and other sciences.
- PSO7 : Lifelong learning: Students will have the ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.
- PSO8 : Employability Skills: This program will help the students to enhance their employability skills for jobs in government, research institutes, MNCs for software development, banks, insurance and investment sectors and in various other public and private enterprises.



Department of Mathematics

TARA Government College (A), Sangareddy M.Sc. Mathematics

Course Outcomes

SEM 1-Paper 1-Abstract Algebra

CO1: This course is combination of basic group theory and advanced group theory and gives proper understanding of groups.

CO2: This course deals with Group, symmetric group, Syllow's theorem and more such interesting topics

CO3: After learning this subject students are prepared for basic Algebra.

CO4: This course is beginning of algebra

CO5: With this course students are prepared to learn about higher mathematics, like prepared to learn about Ring theory and field theory ,Galois theory etc.

SEM 1-Paper 2-Mathematical analysis

CO1: Describe the fundamental properties of the real numbers that underpin the formal development of real analysis;

CO2: Demonstrate an understanding of the theory of sequences and series, continuity, differentiation and integration;

CO3: Demonstrate skills in constructing rigorous mathematical arguments;

CO4: Apply the theory in the course to solve a variety of problems at an appropriate level of difficulty;

CO5: Demonstrate skills in communicating mathematics.

SEM 1-Paper 3- Ordinary and partial differential equations

CO1: Apply the fundamental concepts of Ordinary Differential Equations and Partial Differential Equations and the basic numerical methods for their resolution.

CO2: Solve the problems choosing the most suitable method.

CO3: Understand the difficulty of solving problems analytically and the need to use numerical approximations for their resolution.

CO4: Use computational tools to solve problems and applications of Ordinary Differential Equations and Partial Differential Equations.

CO5: Formulate and solve differential equation problems in the field of Industrial Organization Engineering.

SEM 1-Paper 4-Elementary Number Theory

CO1: Explain the concepts of divisibility, prime number, congruence and number theorems.

CO2: Demonstrate knowledge and understanding of topics including, but not limited to divisibility, prime numbers, congruences, quadratic reciprocity, Diophantine equations.

CO3: Learn methods and techniques used in number theory.

CO 4: Write programs/functions to compute number theoretic functions.

CO 5: Use mathematical induction and other types of proof writing.

SEM 1-Paper 5- Discrete Mathematics

CO 1. Students completing this course will be able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.

CO 2. Students completing this course will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.

CO 3. Students completing this course will be able to use tree and graph algorithms to solve problems.

CO 4. Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

SEM 2-Paper 1-Galois Theory

CO 1. Understand the main ideas of Galois theory.

CO 2. Compute Galois groups for fairly simple field extensions, including cyclotomic extensions.

CO 3. Compute Galois groups for fairly simple polynomials.

CO 4. Use the Galois correspondence to solve problems about the structure of fields.

SEM 2-Paper 2- Lebesgue Measure and Integration

CO 1. Understand the construction and properties of Lebesgue measure, including the notion and properties of null set;

CO 2. Understand the construction of the Lebesgue integral and know its key properties;

CO 3. Compute Lebesgue integrals using the Fundamental Theorem of Calculus, Monotone and Dominated Convergence Theorems.

SEM 2-Paper 3 –Complex Analysis

CO 1. Demonstrate understanding of the basic concepts underlying complex analysis.

CO 2. Demonstrate familiarity with a range of examples of these concepts.

CO 3. Prove basic results in complex analysis.

CO 4. Apply the methods of complex analysis to evaluate definite integrals and infinite series.

SEM 2-Paper 4-Topology

CO 1: Demonstrate an understanding of the concepts of metric spaces and topological spaces, and their role in mathematics.

CO 2: Demonstrate familiarity with a range of examples of these structures.

CO 3: Prove basic results about completeness, compactness, connectedness and convergence within these structures.

CO 4: Use the Banach fixed point theorem to demonstrate the existence and uniqueness of solutions to differential equations.

SEM 2-Paper 5 –Theory of differential equations

CO 1. Understand the qualitative nature of ODE, solution of BVP, stability of criteria of autonomous systems.

CO 2. More precisely, students will learn how to do stability analysis of the systems which arise in different areas of science

CO 3. Students will be able to solve the problems using multiple approaches and will learn to classify ODEs.

CO 4. Students will demonstrate an understanding of the theory of ODEs and will work with a variety of applications of ODE.

SEM 3-Paper 1- Functional Analysis

CO 1. They can work with different distance metrics and normed spaces.

CO 2. They will understand the general properties of linear operators and their dependencies on the type of functional spaces

CO 3. They will be familiar with the natural embedding concepts and understand how it works in conjugate spaces.

SEM 3-Paper 2 – General Measure Theory

CO 1. Remember algebra of sets, open and closed sets of real numbers.

CO 2. Understand and analyze outer measure and measurable sets.

CO 3. Understand and analyze convergence in measure.

SEM 3-Paper 3- Linear Algebra

CO 1. Understand the basic ideas of vector algebra: linear dependence and independence and spanning

CO 2. Understand linear transformations, matrix and vectorspace.

CO 3. Able to find eigen values, eigen vectors, diagonal matrix etc.

SEM 3-Paper 4- Operation Research

CO 1. Identify and develop operational research models from the verbal description of the real system.

CO 2. Understand the mathematical tools that are needed to solve optimisation problems.

CO 3. Use mathematical software to solve the proposed models.

CO 4. Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

SEM 3-Paper 5 – Numerical Analysis

- CO 1. Locate and use information to numerically solve problems. This will be assessed through homework, class quizzes and tests, and a final exam .
- CO 2. Work effectively with others to complete homework and class assignments. This will be assessed through graded assignments and class discussions.
- CO 3. Demonstrate ability to think critically by analyzing a practical problem and understanding the mathematical basis of the problem. . This will be assessed through class assignments, tests and a final exam.

SEM 4-Paper 1- Inegral equations and Calculus of variations

- CO 1. Able to recognize difference between Volterra and Fredholm Integral Equations, First kind and Second kind, Homogeneous and inhomogeneous etc.
- CO 2. They apply different methods to solve Integral Equations.
- CO 3. Students will have much better and deeper understanding of the fundamental concepts of the space of admissible variations and concepts of a weak and a strong relative minimum of an integral.

SEM 4-Paper 2 – Elementary operator theory

- CO 1. Prove the continuity of concrete linear operators between topological vector spaces.
- CO 2. Given a linear operator, understand whether or not it is compact.
- CO 3. Find the essential spectra of linear operators.

SEM 4-Paper 3 – Analytic Number Theory

- CO 1. The student masters the basic concepts of analytic number theory, including selected arithmetic and multiplicative functions.
- CO 2. The students knows both the additive and the multiplicative definition of the Riemanns zeta function,
- CO 3. The student has an overview of and can formulate the central results and open problems of the subject, including the prime number theorem

SEM 4-Paper 4 – Integral Transforms

- CO 1. Know about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties.
- CO 2. Solve ordinary differential equations using Laplace transforms.
- CO 3. Learn Fourier series, Bessel’s inequality, term by term differentiation and integration of Fourier series.
- CO 4. Apply the concepts of the course in real life problems.

SEM 4-Paper 5 - Advanced Operation Research

- CO 1. It aims at introducing the students to some operational research methods that are used in the systems approach to Engineering and Management.
- CO 2. It provides them with the requisite tools for the mathematical representation of particular emphasizing the roles of uncertainty and risk
- CO 3. Cultivate an ability to analyze the structure of and mathematically model various complex system occurring in industrial Applications.

PROGRAMME OUTCOME – PG

After completion of the program, the student will be able to

PO1 : Students acquire sound analytical and practical knowledge to formulate and solve challenging problems.

PO 2 : Students will be able to read and identify mathematical and computational methods in order to solve comprehensive problems.

PO 3 : Students are well prepared to take jobs in schools and colleges as Mathematic Teachers and Professors, Software Industries, Research and Development Organizations.

PO 4 : Students to pursue higher studies in Mathematical and Computing Sciences and to clear Competitive exams like SET/ NET/ TET etc.

PO5 : Students to learn and apply Mathematics in real life situations aiming at service to the society.

PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will

PSO1 : Provide Strong foundation and inculcate ample knowledge on topics in pure and applied mathematics, empowering the students to pursue higher degrees at reputed academic institutions.

PSO 2 : Advanced mathematical topics provide opportunities to research students for communication and discussion.

PSO 3 : Demonstrate the highest standard of ethics in research.

PSO 4 : Provide scope for interaction with international researchers and developing collaborations.

PSO 5 : Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.

PSO 6 : Nurture problem solving skills, thinking, creativity through assignments, project work.