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Department of Mathematics

Programme Outcomes, Program Specific Outcomes and Course Outcomes

Program outcomes (PO) of B.Sc. (Mathematics) :

PO1: It explains the importance of mathematics and investigate the real world problems and learn to how to apply mathematical ideas and models to those problems.

PO2: Reason mathematically and apply rigorous, analytic, highly numerate approach to analyse, execute tasks and solve problems in daily life and at work.

PO3: Recognize the power of abstraction and generalization, and to carry out investigative mathematical work with independent judgment.

PO4: Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods.

PO5: Identify the type and solve abstract mathematical problems and give geometrical interpretation of various concepts.

PO6: Recognize connections between different subjects in mathematics.

PO7: Develop an understanding of the underlying unifying structures of mathematics (sets, relations and functions, logical structure) and the relationships among them.

PO8: Conduct self-evaluation, and continuously enrich them through lifelong learning.

PO9: Communicate and interact effectively with different audiences and collaborate intellectually and creatively in diverse contexts, while emphasizing the importance of clarity and precision in communication and reasoning.
PO10: Formulate and analyse mathematical problems, precisely define the key terms, and draw clear and reasonable conclusions.

Programme Specific Outcomes (PSO) of B.Sc. (Mathematics) :

PSO1: Help the students to enhance their knowledge in soft skills and Computing skills.
PSO2: Enable the students to equip knowledge in various concepts involved in functions of single variable.
PSO3: Enable the students to equip knowledge in various concepts involved in Calculus and geometry.

Course Outcomes

F.Y. B. Sc. (Mathematics) SEMESTER - I

Course Outcomes (CO) of Course MT111: Algebra-
After successfully completing this course, students will be able to:

CO1: Study sets, Relations and Functions.
CO2: Explain algebraic properties of integers, finding gcd by Euclidean Algorithm.
CO3: Recognise technical terms and appreciate some of the uses of algebra.
CO4: collect like terms and simplify expressions term by term.
CO5: Solving problems using first principle of Mathematical induction and strong induction.

Course Outcomes (CO) of Course MT-112: Calculus I-
After successfully completing this course, students will be able to:

CO1: Gain Knowledge of fundamental concepts of real numbers.
CO2: Verify the value of the limit of a function at a point using the definition of the limit.

CO3: Introduction to sequences and series.
CO4: Learn to check function is continuous, understand the consequences of the intermediate value theorem for continuous functions.

Course Outcomes (CO) of Course MT-113: Practical Course based on MT-111 and MT-112 -

CO1: Learn Maxima software.
CO2: Can solve problems of algebra and calculus using maxima software.
CO3: Knowledge of application of mathematics.

Course Outcomes

F.Y. B. Sc. (Mathematics) SEMESTER-II

Course Outcomes (CO) of Course MT- 121: Analytical Geometry-

CO1: Introduction to analytical geometry of 2 dimensions.
CO2: Study of lines in 2 and 3 dimensions.
CO3: Finding equation in various form of line, circle, ellipse, sphere, cones etc.
CO4: Give the knowledge of geometry using maxima software.

Course Outcomes (CO) of Course MT-122: Calculus II-

CO1: Student understand differentiation and fundamental theorem in differentiation and various rules.
CO2: Geometrical representation and problem solving on MVT and Rolls theorem. Finding extreme values of function.
CO3: Introduction to Ordinary Differential Equations.

Course Outcomes (CO) of Course MT-123: Practical Course based on MT-121 and MT-122

CO1: Learn Maxima software.

CO2: Can solve problems of analytical geometry and calculus by using maxima software.
CO3: Solution of problems on geometry and calculus.

Course Outcomes

S.Y. B. Sc. (Mathematics) SEMESTER-I

Course Outcomes (CO) of Course MT-231: Calculus of Several Variables-

CO1: To find limit and check for continuity of a function of a several variables.
CO2: To find partial derivatives.
CO3: Study of Chain Rule and homogeneous functions.
CO4: Applications of Euler's theorem.
CO5: To find extreme values of a function.
CO6: To find multiple integral.

Course Outcomes (CO) of Course MT-232(A): Numerical Methods and its Applications-

CO1: Recall definitions and formulae of various numerical methods for finding roots of the equations, interpolation.
CO2: Define concepts of Aitken's process.
CO3: Describe methods of solving algebraic and non-algebraic equations.
CO4: Give original examples for concepts in numerical methods.
CO5: Solve the problems in Numerical methods.
CO6: Apply theorem to find numerical solution.
CO7: Calculate numerical integration.

Course Outcomes (CO) of Course MT233: Practical based on MT231 and MT232-

CO1: A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
CO2: A student be able to apply their skills and knowledge,that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

Course Outcomes

S.Y. B. Sc. (Mathematics) SEMESTR –II

Course Outcomes (CO) of Course MT241: Linear Algebra-

CO1: Recall the algebraic properties, commutative, associative laws etc of real numbers.
CO2: Define concepts of Vector Spaces, subspaces, span, kernel, linear dependence etc.
CO3: Describe spanning of vector space, inner product of vectors, linear transformation for set of vectors.
CO4: Give counter examples for set not satisfying properties of subspace.
CO5: Solve examples to find inverse of a linear transformation and check whether linear transformation is bijective or not.
CO6: Apply dimension theorem to find nullity and dimension of vector space.
CO7: Calculate coordinate vector, orthogonally, orthonormality, norm of vectors using formulas.
CO8: Explain Gram Schmidt process to convert basis to orthonormal basis.

Course Outcomes (CO) of Course MT242 (A): Vector Calculus-

CO1: Define vector equation for lines and planes.
CO2: Analyse vector functions to find limits, derivatives, tangent lines, integrals, arc length, curvature, torsion.
CO3: Differentiate vector fields.
CO4: Compute limits and derivatives of functions of two and three variables.
CO5: Calculate work, circulation and flux.
CO6: Determine gradient vector fields and find potential functions.
CO7: Evaluate line integrals, surface area and surface integrals.

Course Outcomes (CO) of Course MT243:Practical based on MT241, MT242(A)-

CO1: List solutions of algebraic and transcendental equations.
CO2: Discuss linear independence of a set.
CO3: Examples of Vector Calculus.
CO4: Solve examples of finding rank, nullity using dimension theorem.
CO8: Calculate inner product, norm.

Course Outcomes

T.Y. B. Sc. (Mathematics) SEMESTER-I

Course Outcomes (CO) of Course MT331: Metric Spaces-

After successfully completing this course students will be able to:

CO1: Define Metric Spaces, Open Sphere, Closed Sphere etc.by using basic concepts.
CO2: Recall all the definitions and concepts by giving examples in Metric space.
CO3: Describe the concepts of Boundary point, interior point, Closure by using concept of open and closed sphere.
CO4: Solve tricky examples of closure and boundary points using basic definitions.
CO5: Illustrate theorems of connectedness and compactness by using basic concept of closed and bounded set.
CO6: Classify and apply concepts for solving problems of separated sets, disconnected set by using concept of connected sets.
CO7: Draw diagrams and analyse it for solving examples of limit point, cluster points using basic concept of open set and closed set.
CO8: Choose appropriate method for solving examples of connected and disconnected set by using concept of separated sets.

Course Outcomes (CO) of Course MT332: Real Analysis – I

After successfully completing this course students will be able to:

CO1: Recall the algebraic properties of real numbers, basics of sets, functions and types of function.

CO2: Define concepts of sequences, bounded sequence, monotone sequence and Cauchy sequence.
CO3: Describe the methods like Cauchy condensation test, Leibnitz test, root test, comparison test, ratio test to check convergence and divergence of sequences and series.
CO4: Explain the completeness of a system of real numbers, lub, glb of a sequence and elaborate various concepts as countable set, uncountable set, cantor set using real life examples.
CO5: Give examples for both sequences Sn and tn diverge but addition, subtraction, multiplication of the sequences converges.
CO6: Solve the absolute and conditional convergence of series.
CO7: Classify the problems on series and apply methods of Cauchy condensation test, Leibnitz test, root test, comparison test, ratio test to check convergence and divergence of sequences and series to solve it.
CO8: Classify the sequence into bounded, unbounded and oscillatory type.

Course Outcomes (CO) of Course MT333: Problem Course based on MT 331 &MT 332-

After successfully completing this course, students will be able to:

CO1: List sequence as oscillatory, convergent or divergent.
CO2: List properties of metric space, convergent sequences, Cauchy sequences.
CO3: Explain convergence and divergence of sequence using test.
CO4: Describe open and closed sphere and open and closed sets.
CO5: Explain convergence and divergence of series using Cauchy condensation test, comparison test, root test, ratio test.
CO6: Apply compactness property to solve examples.
CO7: Learn properties of real numbers.
CO8: Choose appropriate method to solve examples on class l2.

Course Outcomes (CO) of Course MT334: Group Theory

After successfully completing this course, students will be able to:

CO1: Define binary operation, Group, Subgroup, cyclic group, normal subgroup.

CO2: Describe the concepts of cycle, transpositions of permutation, order of cycle.
CO3: Give examples of monoid, group, subgroup, abelian group, normal group, factor group, cyclic group.

Course Outcomes (CO) of Course MT335: Ordinary Differential Equations-

After successfully completing this course, students will be able to:

CO1: Learn what an ODE is, what constitutes a solution, what initial value problems are and what constitutes a solution.
CO2: They will learn to classify ODEs.

Course Outcomes (CO) of Course MT336: Problem Course based on MT 334 & MT 335-

After successfully completing this course, students will be able to:

CO1: Recall and apply Sylow's Theorems to determine the structure of certain groups of small order.
CO2: Understand and use the terms homomorphism and isomorphism. Understand, use the properties of and manipulate permutations.
CO3: Understand and use the properties of group actions.
CO4: Students will learn to visualize and manipulate ODEs in graphical, numerical, and symbolic form.

Course Outcomes (CO) of Course MT337A: Operation Research-

After successfully completing this course, students will be able to:

CO1: Formulate and solve problems as networks and graphs.
CO2: Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transportation problems.

Course Outcomes (CO) of Course MT337F: Number Theory-

After successfully completing this course, students will be able to:

CO1: Analyse hypotheses and conclusions of mathematical statements.
CO2: Apply different methods of proof to verify mathematical assertions including proof by induction, by contrapositive and by contradiction.
CO3: solve systems of Diophantine equations.

Course Outcomes (CO) of Course MT338: Prcatical based on MT337A and Course MT337F-

After successfully completing this course, students will be able to:

CO1: Solve the problems using special solution algorithms.
CO2: Remainder Theorem & the Euclidean algorithm

Course Outcomes

T.Y. B. Sc. (Mathematics) SEMESTER-II

Course Outcomes (CO) of MT341: Complex Analysis-

After successfully completing this course, students will be able to:

CO1: Define the concepts of derivation of analytic functions.
CO2: Define the concepts of sequences and series of the complex functions.
CO3: Define the concepts of Taylor and Laurent series.

Course Outcomes (CO) of MT342: Real Analysis-II-

After successfully completing this course, students will be able to:

CO1: Define the concepts of Sets of measure zero.
CO2: Study Riemann integral.
CO3: Study point wise and uniform convergence of series of functions.

Course Outcomes (CO) of Course MT343: Problem Course based on MT 341 &MT 342-

After successfully completing this course, students will be able to:

CO1: Express concepts of convergence sequences and series of the complex functions.
CO2: Solve examples based on Cauchy residue theorem.
CO3: Solve examples of point wise and uniform convergence of series of functions.

Course Outcomes (CO) of Course MT344: Ring Theory-

After successfully completing this course, students will be able to:

CO1: Validate and critically assess a mathematical proof.
CO2: Use a combination of theoretical knowledge and independent mathematical thinking to investigate questions in ring theory and to construct proofs.

Course Outcomes (CO) of Course MT345: Partial Differential equations-

After successfully completing this course, students will be able to:

CO1: Use knowledge of partial differential equations (PDEs), modelling, the general structure of solutions, and analytic and numerical methods for solutions.
CO2: Formulate physical problems as PDEs using conservation laws.
CO3: Understand analogies between mathematical descriptions of different (wave) phenomena in physics and engineering.
CO4: Classify PDEs, apply analytical methods, and physically interpret the solutions.

Course Outcomes (CO) of Course MT346: Problem Course based on MT 344 &MT 345-

After successfully completing this course, students will be able to:

CO1: solve practical PDE problems with finite difference methods, implemented in code, and analyse the consistency, stability and convergence properties of such numerical methods.
CO2: Interpret solutions in a physical context, such as identifying travelling waves, standing waves, and shock waves.
CO3: Write about ring theory in a coherent, grammatically correct and technically accurate manner.

Course Outcomes (CO) of Course MT347A: Optimization Techniques-

After successfully completing this course, students will be able to:

CO1: Programming problems. Learn classical optimization techniques and numerical methods of optimization.
CO2: Know the basics of different evolutionary algorithms.
CO3: Explain Integer programming techniques.

Course Outcomes (CO) of Course MT347F: Computational Geometry-

After successfully completing this course, students will be able to:

CO1: This course provides an introduction to the key concepts, problems, techniques and data structures within computational geometry, including c concepts of points, lines, planes, spheres, duality, subdivisions and degeneracies.

Course Outcomes (CO) of MT348: Practical based on MT347A and MT347F-

After successfully completing this course, students will be able to:

CO1: Apply different optimization techniques to solve various models arising from engineering areas.

CO2: Study two dimensional transformation and three dimensional transformations.

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Department of Mathematics