Mewar University

Knowledge to Wisdom

MEWAR UNIVERSITY

DEPARTMENT OF MATHAMATICS

1. PROGRAMME OUTCOMES

2. PROGRAMME SPECIFIC OUTCOMES

3. COURSE OUTCOMES

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Program Outcomes (POs)

PO-1 Basic knowledge: Capable of delivering basic disciplinary knowledge gained during the programme.

PO-2 In-depth knowledge: Capable of describing advanced knowledge gained during the programme

PO-3 Critical thinking and problem solving abilities: Capable of analyzing the results critically and applying acquired knowledge to solve the problems.

PO-4: Creativity and innovation: Capable to identify, formulate, investigate and analyze the scientific problems and innovatively to design and create products and solutions to real life problems.

PO-5: Research aptitude and global competency: Ability to develop a research aptitude and apply knowledge to find the solution of burning research problems in the concerned and associated fields at global level.

PO-6: Holistic and Multidisciplinary education: Ability to gain knowledge with the holistic and multidisciplinary approach across the fields

PO-7 Skills enhancement: Learn specific sets of disciplinary or multidisciplinary skills and advanced techniques and apply them for betterment of mankind.

PO-8 Leadership and Teamwork abilities: Ability to learn and work in a groups and capable of Leading a team even.

PO-9 Ethical thinking and Social awareness: Inculcate the professional and ethical attitude and ability to relate with social problems.

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Program Specific Outcomes (PSOs)

Students will be able to

PSO-1: Understand the mathematical concepts and applications in the field of algebra, analysis, computational techniques, optimization, differential equations, engineering, finance and actuarial science.

PSO-2: Handle the advanced techniques in algebra, analysis, computational techniques, optimization, differential equations, engineering, finance and actuarial science to analyze and design algorithms solving variety of problems related to real life problems.

PSO-3: Adopt changing scientific environment in the process of sustainable development by using mathematical tools.

PSO-4: Have necessary skills and expertise in the field of research and developments through seminar and dissertation

PSO-5: Convert the real world problem in to mathematical form.

PSO-6: Understand the concept of pure and applied mathematics

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Course Outcomes M.Sc. Mathematics

Abstract Algebra

CO-1: Apply advanced algebraic concepts to solve complex problems.

CO-2: Analyze and interpret abstract algebraic structures, such as groups, rings, and fields, and demonstrate proficiency in performing algebraic operations within these structures.

CO-3: Construct and apply mathematical proofs using rigorous logic and reasoning, specifically focusing on the fundamental theorems and principles of abstract algebra.

CO-4: Utilize algebraic techniques to study and investigate real-world phenomena, such as cryptography, coding theory, and error correction, and apply abstract algebraic concepts to solve related problems.

CO-5: Communicate mathematical ideas and findings effectively, both orally and in writing, using precise and concise mathematical language, notation, and formalism, to present abstract algebraic concepts and their applications to a diverse audience.

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Analysis

CO-1: Apply advanced mathematical techniques to analyze and solve complex problems in various branches of mathematics, such as algebra, analysis, geometry, and discrete mathematics.

CO-2: Develop a deep understanding of mathematical theories and concepts, and effectively apply them to analyze and interpret real-world phenomena, mathematical models, and data sets.

CO-3: Critically evaluate mathematical arguments and proofs, identify logical fallacies, and construct rigorous mathematical proofs using precise and logical reasoning.

CO-4: Utilize mathematical software and computational tools to perform analytical calculations, simulations, and numerical experiments to gain insights into mathematical structures and phenomena.

CO-5: Communicate mathematical ideas and results effectively through written reports, oral presentations, and mathematical discussions, and demonstrate the ability to collaborate with peers to solve mathematical problems.

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Topology

CO-1: Analyze and interpret various concepts and definitions in topology, including point-set topology, metric spaces, and topological spaces, to establish a solid foundation in the subject.

CO-2: Apply advanced techniques and methodologies in topology to investigate the properties of various types of spaces, such as compact spaces, connected spaces, and Hausdorff spaces.

CO-3: Develop the ability to prove theorems and propositions in topology, demonstrating proficiency in logical reasoning and rigorous mathematical argumentation.

CO-4: Apply topological concepts and techniques to solve real-world problems in diverse areas, including physics, computer science, and engineering, thus showcasing the practical relevance of topology in different domains.

CO-5: Demonstrate critical thinking and problem-solving skills by analyzing and interpreting complex topological structures, such as manifolds, homotopy, and fundamental groups, to advance knowledge and contribute to the field of mathematics.

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Complex Analysis

CO-1: Analyze and apply the principles of complex analysis to solve problems in various branches of mathematics, such as calculus, differential equations, and mathematical physics.

CO-2: Develop a deep understanding of the theory and properties of complex functions, including holomorphicity, analyticity, and singularities, and utilize this knowledge to investigate and solve complex analytic functions.

CO-3: Apply techniques from complex analysis to study and comprehend the behavior of complex integrals, including contour integration, Cauchy's integral theorem, and residue theory, and effectively utilize these concepts in practical applications.

CO-4: Demonstrate proficiency in using complex analysis tools and techniques to explore and solve problems related to conformal mappings, including the transformation of geometric shapes and the study of harmonic functions.

CO-5: Critically analyze and interpret the results obtained from complex analysis methods, and effectively communicate complex mathematical ideas and solutions, both orally and in written form, to both technical and non-technical audiences.

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Special Functions

CO-1: Apply advanced mathematical techniques to solve problems involving special functions, demonstrating a deep understanding of their properties, behaviors, and applications.

CO-2: Analyze and evaluate the convergence and divergence of special function series and integrals, and determine their regions of validity, utilizing appropriate convergence tests and techniques.

CO-3: Demonstrate proficiency in manipulating and manipulating special functions, including but not limited to Bessel functions, Legendre functions, and hypergeometric functions, to solve mathematical equations arising in various fields of science and engineering.

CO-4: Utilize special functions to model and solve real-world problems, such as those encountered in physics, engineering, and other applied sciences, demonstrating the ability to translate practical scenarios into mathematical formulations involving special functions.

CO-5: Critically analyze and interpret research papers and scientific literature related to special functions, gaining an understanding of recent developments, applications, and open problems in the field, and effectively communicate mathematical concepts and results to both technical and non-technical audiences.

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Differential Geometry

CO-1: Apply the fundamental concepts of differential geometry to analyze and describe the properties of curves and surfaces in three-dimensional space.

CO-2: Demonstrate proficiency in calculating various geometric quantities, such as axes of plane sections, generating lines.

CO-3: Analyze and interpret the local and global geometric properties of generators and projection of generators.

CO-4: Formulate and solve problems involving transformation of coordinates, mappings, and isometries in differential geometry, utilizing appropriate mathematical techniques and tools.

CO-5: Apply differential geometry principles to analyze and investigate advanced topics, such as conicoid., with a focus on applications in physics, engineering, and other relevant fields.

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Functional Analysis

CO-1: Apply the fundamental concepts and techniques of functional analysis to analyze and solve mathematical problems in various areas of mathematics.

CO-2: Demonstrate a deep understanding of the properties and structures of normed spaces, Banach spaces, and Hilbert spaces, and their applications in mathematical analysis.

CO-3: Analyze and apply the concepts of linear operators, including bounded and unbounded operators, in the context of functional analysis, and employ them to solve problems related to linear equations and eigenvalue problems.

CO-4: Investigate and analyze the convergence of sequences and series in functional analysis, and utilize these concepts to study the convergence of functions and the approximation of functions using various approximation techniques.

CO-5: Apply the principles of functional analysis to study and analyze the Gram Schmidt Orthogonalization process.

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Discrete Mathematics -I

CO-1: Apply the concept of lattices and Boolean algebra.

CO-2: Apply advanced principles of discrete mathematics to solve complex problems in various fields of mathematics and computer science.

CO-3: Utilize the fundamental concepts of graph theory, including graph representation, connectivity, coloring, and traversal algorithms, to model and solve real-world problems.

CO-4: Demonstrate proficiency in understanding and applying the principles of set theory, including set operations, relations, functions, and their properties, in order to solve problems in various mathematical contexts.

CO-5: Apply the fundamental concepts of formal logic, propositional logic, and predicate logic, as well as techniques such as truth tables and logical equivalences, to analyze and construct logical arguments and solve problems related to logical reasoning and deductive thinking.

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Mechanics

CO-1: Apply mathematical principles and techniques to analyze and solve problems related to equation of continuity.

CO-2: Demonstrate a deep understanding of fundamental concepts such as of rotational and irrational motion, Kapler's law, Lorentz transformation and their application in solving complex mechanical problems.

CO-3: Develop proficiency in using mathematical tools, such as calculus and differential equations, to model and solve problems involving forces, motion, and mechanical systems.

CO-4: Apply mathematical methods to analyze and interpret experimental data in the context of mechanics, and draw conclusions regarding the behavior of physical systems.

CO-5: Demonstrate the ability to communicate effectively, both orally and in writing, about mathematical concepts and their applications in mechanics, including the presentation of problem-solving techniques and the interpretation of results.

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Tensor Analysis

CO-1: Apply tensor analysis concepts to solve problems in mathematical physics, engineering, and other related fields, demonstrating a deep understanding of tensor algebra and calculus.

CO-2: Analyze and manipulate covariant and contravariant tensors, including their transformation properties, and effectively utilize them to model and solve problems in various mathematical and physical contexts.

CO-3: Formulate and solve problems involving tensor fields, such as the calculation of derivatives, integration, and line integrals, in order to investigate and describe properties of curved spaces, differential geometry, and general relativity.

CO-4: Evaluate and employ tensor operations and coordinate transformations to derive and solve systems of partial differential equations arising from the study of elasticity, fluid mechanics, electromagnetism, and other branches of physics.

CO-5: Utilize tensor analysis techniques to analyze and comprehend geometric objects and structures in multi-dimensional spaces, making connections with concepts from linear algebra, differential forms, and other advanced mathematical disciplines.

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Numerical Analysis

CO-1: Apply numerical methods to solve mathematical problems across various fields, such as calculus, linear algebra, differential equations, and optimization.

CO-2: Analyze and interpret numerical data to make informed decisions, assess accuracy, and evaluate the limitations of numerical algorithms and methods.

CO-3: Develop computational models and algorithms to solve complex mathematical problems, including interpolation, numerical integration, root finding, and solving systems of linear and nonlinear equations.

CO-4: Extend the knowledge of students to do research work using these methods and similar type of other methods.

CO-5: Apply critical thinking skills to analyze and compare different numerical methods, identify their strengths and weaknesses, and select appropriate techniques to solve mathematical problems efficiently and accurately.

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Discrete Mathematics -II

CO-1: Apply advanced concept of Graph theory and tree.

CO-2: Analyze and evaluate algorithms and their efficiency, demonstrating an understanding of their complexity and applicability in different computational scenarios.

CO-3: Design and implement mathematical models using discrete structures such as graphs, trees, and combinatorial structures to solve real-world problems in diverse domains.

CO-4: Utilize advanced techniques, of the concept of Matching's and Colourings.

CO-5: Demonstrate proficiency the concept of connectivity and network flow, and theorems in various mathematical domains.