

M.Sc. Tech (IMCA)

Program Outcome:

- An ability to apply knowledge of mathematics and computer science in practice.
- An ability to identify, critically analyze, formulate and solve problems with comprehensive knowledge in the area of specialization.
- An ability to contribute by research and innovation to solve real life problems.
- An ability to devise and conduct experiments, interpret data and provide well informed conclusions.
- An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude.
- An ability to communicate effectively.
- An ability to appreciate the importance of goal setting and to recognize the need for life-long reflective learning.

Program Specific Outcome:

- A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such annotations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved with mathematical reasoning.
- A student should get adequate exposure to global and local concerns so as to explore many aspects of Mathematical Sciences.
- Students should 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.
- A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.
- A student should be able to write necessary algorithms and programs in different languages as per the need of the industry
- Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.

- Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skill, creative talent and power of communication necessary for various kinds of employment.

SEM-I

Course Outcome:

MIM – 101: Real Analysis

- Describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- Comprehend rigorous arguments developing the theory underpinning real analysis.
- Demonstrate an understanding of limits and how they are used in sequences, series, Construct rigorous mathematical proofs of basic results in real analysis.
- Understand integrability and theorems on integrability. Recognize the difference between point wise and uniform convergence of a sequence of functions.
- Illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability and integrability.
- Study improper integration using Riemann integration.

MIM – 102: Linear Algebra

- Use computational techniques and algebraic skills essential for the study of systems of Linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, Orthogonality and Diagonalization. (Computational and Algebraic Skills).
- Use visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems, and view solutions, especially in \mathbb{R}^2 and \mathbb{R}^3 , as well as conceptually extend these results to higher dimensions. (Geometric skills)
- Critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra. (Proof and Reasoning).

- Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as an aid in solving problems and presenting solutions (Technological Skills).
- Communicate and understand mathematical statements, ideas and results, both verbally and in writing, with the correct use of mathematical definitions, terminology and symbolism (Communication Skills).
- Work collaboratively with peers and instructors to acquire mathematical understanding and to formulate and solve problems and present solutions (Collaborative skills).

MIM – 103: C Programming

- Able to implement the algorithms and draw flowcharts for solving Mathematical problems.
- Demonstrate and understanding of computer programming language concepts.
- Ability to design and develop computer programs, analyze and interprets the concept of pointers, declarations, initializations, operations on pointers and their usage.
- Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures. Students must be able to define union and enumeration user defined data types.

MIM – 104: Database Management System

- Gain Knowledge of fundamental concepts of database.
- Understand user requirements and frame it in data model.
- Ability in creations, manipulation and querying of data in databases.
- Ability to solve real world problems using appropriate set, function, and relational models.
- Ability to design E-R Model for given requirements and convert the same into database tables

MIM – 105: LAB Work

- Devise pseudocode and flowchart for computational problems

- Write debug and execute simple programs in C
- Create database tables in Postgres SQL
- Write and execute simple and nested queries

SEM-II

MIM – 201: Complex Analysis

- Compute sums, products, quotients, conjugate, modulus, and argument of complex numbers · Define and analyze limits and continuity for complex functions as well as consequences of continuity ·
- Conceive the concepts of analytic functions and will be familiar with the elementary complex functions and their properties · Determine whether a given function is differentiable, and if so find its derivative. Applies the theory into application of the power series expansion of analytic functions ·
- Understand the basic methods of complex integration and its application in contour integration. · Analyze sequences and series of analytic functions and types of convergence, · Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

MIM – 202: Discrete Mathematical Structures

- Be able to construct simple mathematical proofs and possess the ability to verify them.
- Have substantial experience to comprehend formal logical arguments.
- Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.
- Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.
- Acquire ability to describe computer programs (e.g. recursive functions) in a formal mathematical manner.
- Be able to apply basic counting techniques to solve combinatorial problems.

- Gain experience in using various techniques of mathematical induction (weak, strong and structural induction) to prove simple mathematical properties of a variety of discrete structures.

MIM – 203: Data Structure

- To understand different methods of organizing large amount of data using data structure.
- Students develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching, and sorting of each data structure.
- Student will be able to choose appropriate data structure as applied to specified problem definition.
- To introduce various techniques for representation of the data in the real world.
- Compute the complexity of various algorithms.
- Students implement projects requiring the implementation of the above data structures.

MIM – 204: Software Engineering

- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to identify, formulate, and solve engineering problems.
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- The ability to analyze, design, verify, validate, implement, apply, and maintain software systems.

MIM – 205: JAVA

- Implement object oriented programming concepts.
- Use and create package and interfaces in a Java program.
- Use graphical user interface in Java programs
- Developing applets.
- Ability to design User Interface using Swing and AWT

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Course Outcome:

MIM-301: Operational Research

- Model a real-world problem as a mathematical programming model.
- Define and formulate linear programming problems and appreciate their limitations
- Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained and translate solutions into directives for action.
- Conduct and interpret post-optimal and sensitivity analysis and explain the primal-dual relationship.
- Develop mathematical skills to analyze and solve integer programming and network models arising from a wide range of applications.
- At the end of the course the student will be able to plan production schedules and plan resources (material and machine) required for production.

MIM – 302: Algebra

- After completion of the course, the students would be able: To understand Group Auto morphism, Sylow's theorems.
- To understand Homomorphism of rings, Idea of Ideals, Euclidean rings, Modules etc
- Use matrix algebra and the related matrices to linear transformations, Compute and use determinants, Write mathematical proofs and reason abstractly in exploring properties of groups.
- Use the division algorithm, Euclidean algorithm, and modular arithmetic in computations and proofs about the integers.
- Construct examples of, and explore properties of groups, including symmetry groups, permutation groups and cyclic groups.
- Determine subgroups and factor groups of finite groups.
- Use and apply homomorphisms between groups.

MIM 303: Advanced Java

- Learn Java programming language which can be utilized to develop windows and internet based software solutions.

- Interpret the need for advanced Java concepts like enumerations, Autoboxing and annotations.
- Demonstrate the concept of Collections, Comparators, Legacy classes and Interfaces.
- Understand the use of string handling functions.
- Develop distributed web application using Servlets and JSP
- Apply the concepts of JDBC, Transaction processing, statement objects and Result set to perform operations on Database

MIM 304: Operating system

- To analyze system software's like editors, loaders, debuggers, compilers and implement two-pass assembler
- To analyze linkers and loaders and implement macro processor
- Implement process scheduling algorithms and apply bankers algorithm to avoid deadlocks in real time applications
- To apply the concept of process, thread and Implement Process management System call.
- To apply the concept of Disk scheduling and Implement File Handling System Calls.

MIM 305: Lab Work (Advanced Java and Operating system)

- Write a program in Java to implement a Client/Server application using RMI.
- Write a program in Java to create a Cookie and set the expiry time of the same.
- Develop Chat Server using Java.
- Introduction to operating systems concepts, process management, memory management, file systems, virtualization, and distributed operating systems.
- The laboratory exercises will include familiarization with UNIX system calls for process management and inter-process communication
- Experiments on process scheduling and other operating system tasks through simulation/implementation.
- Finally, the students would be required to apply the operating system concepts by experimenting on either xv6/minix operating systems.

MIM 306: Computer Networks

- State the fundamentals related to network security and basics of IPv6 and IPsec

- Explain various protocols related to internet key exchange.
- Define various examples of wireless communication system standards related to 2G and 3G wireless networks.
- Study Adhoc network and its protocols
- **MIM 307 R Programming for basic Data Analysis**
- The students will get acquainted with the basics of Understanding of the R environment.
- Able to work with R packages and their installation Demonstrate exploratory data analysis (EDA) for a given data set.
- Implement and assess relevance and effectiveness of machine learning algorithms for a given dataset
- To familiarize data analysis using R programming
- Learn data analysis using R programming

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MIM 401: Differential Equations

- Make the students understand the concepts of three dimensional geometry , linear ordinary differential equations and vector differentiation and integration
- Concept of Differential equations and their solutions, Idea Mathematical Models using differential equations.
- Understand linear, non- linear ordinary and partial differential equations.
- Existence and uniqueness of solution of a differential equation, Concept of Wronskian, Solution of linear differential equation using various techniques.
- Systems of linear differential equations and their solution using various technique, Phase plane analysis

MIM 402: Statistical Methods

- Describe and discuss the key terminology, concepts tools and techniques used in business statistical analysis
- Recognize important Statistical organizations in India and apply the measures of central tendency, measures of location, measures of dispersion and measures of shape

- Explain the methods for simple random sampling and estimate the population mean, population total and their variances using simple random sampling methods.
- Compare stratified, systematic and cluster sampling with simple random sampling.
- Critically evaluate the underlying assumptions of analysis tools

MIM 403: Design and Analysis of Algorithms

- Design algorithms using divide and conquer and greedy methods
- Describe computational solutions to well-known problems like searching, sorting etc.
- Estimate the computational complexity of different algorithms.
- Devise an algorithm using appropriate design strategies for problem solving.
- Able to analyze String matching algorithms

MIM 405: Internet Programming

- Understand the role of languages like HTML, CSS, XML, Java script, PHP and the workings of the web and web applications.
- Design web pages using HTML, and Cascading Styles sheets.
- Design dynamic web pages using JavaScript (client side programming).
- Understand the basic idea of XML documents and XML Schema.
- Understand the basic idea of interactive web applications using PHP .

MIM 405: Mobile Technologies

- Understand the characteristics of mobile computing and its applications.
- Understand the medium access mechanisms of wireless networks.
- To understand Mobile platforms and to develop Mobile applications
- Explain how the structure of mobile computing applications differs from wireless networking
- Describe different routing protocols available in the wireless network
- Classify the different operating systems available for mobile devices based on mobility

MIM 406: Lab Work (Internet Programming and Mobile Technologies)

- Create a web page with the following using HTML To embed an image map in a web page To fix the hot spots
- Create a web page with all types of Cascading style sheets.
- Write programs in Java using Servlets-To invoke servlets from HTML forms

- Mobile computing is a new emerging area in computer science. Research results on mobile security are rising dramatically due to the dramatic increase in the device market.
- The designed context aware projects are well polished regarding the course concepts and software development processing cycle. Each development phase is managed by tasks that correlate to the student's role and timeline.
- All projects need to promote student learning outcomes to reinforce the association of actions between project goal, expectations and design tasks.
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