ANDHRA MAHILA SABHA
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- Critically assess mathematical arguments, models, and solutions for validity, efficiency, and relevance.
- Innovate by developing new mathematical models, formulating conjectures, and contributing original research to the field.

Program Objectives PG MSC Mathematics with Computers

The Post Graduate degree programme MSc Mathematics with Computer Science started in the year 2014 with an aim of interdisciplinary approach in line with current trend in scientific research which multidisciplinary and adaptive Post Graduates shall have strong foundation in mathematics and Computer Science and can apply this knowledge in teaching, research and software industry.

Program Outcomes

After completion of the Programme the student is able to

- Apply Mathematical concepts to solve problems in various areas of Pure mathematics.
- locateMathematical methods as needed in order to solve problems
- Develop proficiency in the analysis of complex physical problems and the use of Mathematical techniques to solve them.
- Communicate effectively by oral, written, computing and graphical means.
- Able to pursue their careers in research and in the software industry
- students will be able to work on a project in collaboration with well-established software development organizations and acquire demonstrable experience in the design, development and documentation of a software product of significant size and complexity

Programme Educational Objectives (PEOs)

The B.Sc (MSCs) programme aims to prepare graduates who will:

PEO 1: Develop a strong foundation in Mathematics,, and Computer Science to solve real-world problems and pursue research in related disciplines.

PEO 2: Acquire analytical, logical, and computational skills to apply theoretical knowledge effectively in various professional and interdisciplinary contexts.

PEO 3: Demonstrate proficiency in using modern tools, programming languages, and software, modeling, and decision-making.

PEO 4: Engage in continuous learning and adapt to emerging technologies to meet the evolving demands of industry and academia.

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Program Objectives (PO's)

Upon successful completion of the B.Sc (MSCs) programme, students will be able to:

PO 1: Knowledge Application

Apply fundamental concepts of Mathematics, Statistics, and Computer Science to analyze and solve real-world scientific and computational problems.

PO 2: Critical Thinking and Problem Solving

Develop analytical and logical reasoning skills to identify, formulate, and provide effective solutions using quantitative and computational approaches.

PO 3: Modern Tool Usage

Use appropriate statistical, computational, and programming tools to design, analyze, and interpret data efficiently.

PO 4: Data Analysis and Interpretation

Apply statistical and computational techniques to collect, organize, and interpret data for informed decision-making.

Programme Outcomes (POs)

On successful completion of the B.Sc (MSCS) programme, students will be able to:

PO 1: Disciplinary Knowledge
Demonstrate comprehensive knowledge of Mathematics, Statistics, and Computer Science and apply it to solve theoretical and practical problems.

PO 2: Problem Analysis

Identify, analyze, and provide logical solutions to complex problems using mathematical modeling, , and computational methods.

PO 3: Modern Tool Usage

Use modern software tools, programming environments, and statistical packages to analyze data, design algorithms, and develop efficient applications.

PO 4: Data Handling and Interpretation

Collect, process, and interpret data using appropriate statistical and computational techniques for effective decision-making.

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PROGRAM SPECIFIC OUTCOMES(PSOs)

(For Postgraduate Programme in Mathematics)

PSO 1 – Mastery of Abstract and Linear Algebraic Structures

→ *Bloom's Levels: Understand, Apply*

Graduates will be able to demonstrate a comprehensive understanding of algebraic systems such as groups, rings, fields, and vector spaces, and apply algebraic concepts and transformations to analyze and classify mathematical structures.

PSO 2 – Analytical and Structural Problem Solving

→ *Bloom's Levels: Apply, Analyze*

Graduates will be able to apply decomposition theorems, bilinear and quadratic form theories, and canonical representations to analyze the structure and behavior of linear operators and algebraic systems, enhancing their problem-solving and analytical skills.

PSO 3 – Proficiency in Complex Function Theory

→ *Bloom's Levels: Analyze, Evaluate*

Graduates will be able to examine and evaluate the properties of analytic, harmonic, and conformal mappings in the complex plane, and apply integration and residue techniques to solve advanced problems in complex analysis and transformation theory.

PSO 4 – Research, Abstraction, and Logical Reasoning Skills

→ *Bloom's Levels: Evaluate, Create*

Graduates will be able to develop abstract reasoning and proof-writing proficiency, formulate and validate mathematical models or theorems, and pursue innovative research or applications in pure and applied branches of mathematics.

Program Specific Outcomes (PSOs)

(For Postgraduate Programme in Computer Science)

PSO 1 – Mastery of Core Computing and System Concepts

→ *Bloom's Levels: Understand, Apply*

Graduates will be able to demonstrate a comprehensive understanding of core computer science principles, including operating systems, computer networks, and programming paradigms, and apply this knowledge to analyze, design, and optimize system-level and application-level operations.

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PSO 2 – Proficiency in Object-Oriented and High-Level Programming

→ *Bloom's Levels: Apply, Analyze*

Graduates will be able to apply object-oriented concepts, multithreading, exception handling, and file management techniques in Java and Python to design, develop, and test efficient, reusable, and maintainable software solutions.

PSO 3 – Design and Development of Networked and Interactive Applications

→ *Bloom's Levels: Analyze, Evaluate*

Graduates will be able to design and implement interactive, web-based, and distributed applications using technologies such as Swing, Servlets, JDBC, RMI, and network communication protocols, ensuring secure, reliable, and scalable connectivity.

PSO 4 – Integration of Computing, Networking, and Programming Skills

→ *Bloom's Levels: Evaluate, Create*

Graduates will be able to integrate system-level understanding with programming and networking competencies to develop innovative, data-driven, and network-aware solutions for real-world challenges in distributed, cloud, and intelligent computing environments.

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Semester I

Subject Code: MCS 401	
No. of credits	**5**
Instructional hours	**5+ 1 T* hrs/w**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 + 70)**

Paper-I: Abstract Algebra

Course Objectives: The course aims to:

1. Introduce students to the fundamental concepts of abstract algebra, including groups, rings, and fields.
2. Develop a deep understanding of structural properties of algebraic systems such as solvable groups, nilpotent groups, and finite abelian groups. 3. Familiarize students with advanced topics like ideals, homomorphisms, unique factorization domains, principal ideal domains and Euclidean domains.
4. Train students in logical reasoning, theorem proving and abstract thinking through the study of group theory and ring theory
5. Provide a strong foundation for research and application of algebra in mathematics and allied fields such as computer science, cryptography and coding theory.

Course Outcomes: After successful completion of this course, students will be able to:

1. Understand and apply the concepts of automorphisms, conjugacy, solvable and nilpotent groups.
2. Analyze group structures using direct products, Sylow's theorems, and classification of finite abelian groups.
3. Demonstrate proficiency in working with ideals, homomorphisms, maximal and prime ideals, and Zorn's lemma in algebraic settings.
4. Explore ring theory by studying unique factorization domains, principal ideal domains, Euclidean domains, and polynomial rings over UFDs.
5. Apply abstract algebraic methods to solve problems in advanced mathematics, and theoretical Computer science.

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Semester -I

Subject Code: MCS 402	
No. of credits	**5**
Instructional hours	**5+ 1 T* hrs/w**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 + 70)**

Paper-II: Mathematical Analysis

Course Objectives:

1. Understand the fundamental concepts of metric spaces, including compactness, connectedness, and perfect sets.
2. Develop a conceptual understanding of continuity, limits, and properties of continuous and monotonic functions.
3. Apply the theory of the Riemann-Stieltjes integral to real and vector-valued functions.
4. Analyze the convergence of sequences and series of functions and explore their impact on integration and differentiation,

Course Outcomes:

1. Describe and classify metric space structures.
2. Explain and examine the role of continuity and discontinuity in function behavior across different topological structures.
3. Compute the Riemann-Stieltjes integral and apply it to practical examples involving rectifiable curves and vector functions.
4. Evaluate the uniform convergence of sequence of functions and apply the Stone-Weierstrass theorem and contraction principle in problem-solving.

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SEMESTER-I

Subject Code: MCS 403	
No. of credits	**5**
Instructional hours	**5+ 1 T* hrs/w**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 + 70)**

Paper-III: Differential Equations

Course Objectives

1. To understand the existence and uniqueness of solutions and power series methods for solving ordinary differential equations.
2. To study the properties and applications of special functions such as Legendre's and Bessel's functions. solving first-order non-linear and higher-order linear partial differential equations.
3. To introduce methods for 4. To learn techniques for solving second-order PDEs with variable coefficients, including the separation of variables method.

Course Outcomes: After successful completion of this course, students will be able to

1. Use Picard's method of successive approximations and the Frobenius method for finding series solutions to ODES
2. Apply the properties, recurrence relations, and generating functions of Legendre and Bessel polynomials.
3. solve non-linear PDEs using Charpit's and Cauchy's methods of characteristics.
4. classify any second-order PDE, then convert it into its canonical form and use the separation of variables method to solve the heat, wave, and Laplace equations.

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SEMESTER -I

Subject Code: MCS 404	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 +70)**

Paper IV: Operating System

Course Objectives: The Course aims to

1. To introduce the principles, functions, and architecture of modern operating systems.
2. To develop an understanding of process management, memory management, file systems, and device management.
3. To expose students to concurrency, synchronization, and deadlock handling techniques.
4. To provide insights into advanced OS concepts such as distributed systems, virtualization, and security.

Course Outcomes: After successful completion of this course, students will be able to

1. Explain the structure, services, and functions of modern operating systems.
2. Analyze process scheduling, synchronization, and deadlock handling techniques.
3. Evaluate memory management, file systems, and storage strategies.
4. Demonstrate understanding of advanced OS concepts including distributed systems, virtualization, and security.

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SEMESTER -I

Subject Code: MCS 434	
No. of credits	**1**
Instructional hours	**2 hrs/wk**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**25 marks**
Max.marks	**25**

Paper-IV: Operating Systems Lab

Course Objectives: The Course aims to

1. To provide hands-on experience with basic operating system functionalities.
2. To enable students to implement CPU scheduling, memory management, file management, and disk scheduling algorithms.
3. To develop skills in process synchronization and inter-process communication.
4. To strengthen practical knowledge of Linux system calls, shell scripting, and OS concepts through simulation.

Course Outcomes: After successful completion of this course, students will be able to

1. Apply Linux shell scripting for automation of system-level tasks.
2. Simulate and analyze CPU scheduling, memory allocation, and page replacement algorithms.
3. Implement inter-process communication and synchronization mechanisms using semaphores, monitors, and shared memories.
4. Design and develop a simple operating system simulator integrating multiple OS functionalities.

List of Programs:

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SEMESTER - I

Subject Code: MCS 405	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 +70)**

Paper –V: programming in java

Course Objectives:

1. Understand Web Application and Enterprise Application Development.
2. Learn Database Integration, Web Services Development.
3. Understand building Real-World Applications.

Course Outcomes: After successful completion of this course, students will be able to

1. Identify the syntax and semantics of Java programming concepts.
2. Write programs using classes, objects, inheritance, encapsulation and polymorphism.
3. Apply the concepts of multithreading, exception handling mechanisms to develop efficient Program.
4. Design event driven GUI using APPLET, AWT and Swing Components.
5. Discuss the RMI Architecture and Design Application using RMI Interfaces and classes.
6. Describe JDBC and Hibernate to provide a program level interface for communicating with database

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SEMESTER - I

Subject Code: MCS 435	
No. of credits	**1**
Instructional hours	**2 hrs/wk**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**25 marks**
Max.marks	

PAPER-VI Programming in Java Lab

Course Objectives: The Course aims to

1. To write programs using abstract classes.
2. To write programs for solving real world problems using java collection frame work.
3. To write multithreaded programs.
4. To write GUI programs using swing controls in Java.
5. To introduce java compiler and eclipse platform.
6. To impart hands-on experience with java programming.
7. To Write Java Advanced Programs.

Course Outcomes: After successful completion of this course, students will be able to

1. Discuss OOP concepts and basics of Java programming.
2. Apply OOP and Java programming in problem solving.
3. Develop applications on files, exceptions, threads and applets.
4. Create different programs using packages.
5. Construct GUI based applications using AWT/Swing Components.
6. Evaluate inheritance using Java.
7. Design Interactive applications using RMI, Servlets and Hibernate technologies.

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Semester II

Subject Code: MCS 451	
No. of credits	**5**
Instructional hours	**5+ 1 T* hrs/w**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 + 70)**

Paper- I: Linear Algebra

Course Objectives:

1. To introduce the notions of diagonalizability of a linear operator.
2. To study relation between projections and invariance of subspaces.
3. To deduce the cyclic decomposition for a finite dimensional vector space.
4. To understand the rational canonical form, Jordan canonical forms of matrices.
5. To determine the nature of quadratic forms and real symmetric, skew-symmetric matrices with the aid
   Of bilincar forms.

Course Outcomes: After completion of this course, students will be able to

1. Characterize the linear operators which are diagonalizable.
2. Express linear operator as a sum of diagonalizable and nilpotent linear operators.
3. Write similarity classes of matrices with the aid of rational canonical form and Jordan canonical forms.
4. Determine those matrices which are diagonalizable and these matrices which possess block diagonal
   Representation.

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Semester II

Subject Code: MCS 452	
No. of credits	**5**
Instructional hours	**5+ 1 T* hrs/w**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 + 70)**

Paper-II Complex Analysis

Course Objectives:

1. Understand and Analyze Analytic Functions and Mappings in the Complex Plane Develop a foundational understanding of complex functions, including limits, continuity, differentiability, the Cauchy-Riemann equations, and mappings (e.g., exponential mappings), with the ability to identify and work with analytic and harmonic functions.
2. Apply Integral Theorems and Series Expansions in Complex Analysis. Gain proficiency in evaluating contour integrals, understanding Cauchy's Theorems (Cauchy-Goursat and Cauchy Integral Formula), and applying series representations such as Taylor and Laurent series for complex functions.
3. Identify Singularities and Evaluate Residues for Complex Integrals. Analyze isolated singular points and compute residues, including those at infinity. Apply residue theory and techniques such as Jordan's Lemma and indented paths to evaluate improper integrals, particularly those relevant in Fourier analysis.
4. Utilize Conformal and Linear Fractional Mappings for Function Visualization. Explore and apply advanced mapping techniques such as linear fractional transformations and conformal mappings to visualize and transform regions in the complex plane, including applications of Rouche's Theorem and the Argument Principle.

Course Outcomes:

1. Demonstrate understanding of complex functions and their analytic properties Students will be able to analyze functions of a complex variable, apply the Cauchy-Riemann equations, and determine the conditions for differentiability and analyticity in various regions of the complex plane.
2. Evaluate contour integrals and apply major theorems in complex integration. Students will gain the ability to compute contour integrals, understand and apply the Cauchy-Goursat

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Theorem and Cauchy Integral Formula, and use these results to derive key properties of analytic functions.

3. Classify singularities and compute residues to evaluate complex integrals. Students will be able to identify isolated singular points, compute residues at poles and infinity, and apply the Residue Theorem to evaluate improper and definite integrals, including those arising in Fourier analysis.
4. Apply conformal mappings and transformation techniques in complex analysis. Students will develop the skill to use linear fractional transformations, conformal mappings, and principles such as Rouche's Theorem and the Argument Principle to study function behavior and perform geometric transformations in the complex plane

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Semester II

Subject Code: MCS 453	
No. of credits	**5**
Instructional hours	**5+ 1 T* hrs/w**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 + 70)**

Paper - III: Discrete Mathematics

Course Objectives:

1. Understand the foundational principles of logic, proofs, and Boolean algebra essential for mathematical reasoning.
2. Apply combinatorial techniques and counting principles to solve complex enumeration problems.
3. Analyze and solve recurrence relations using generating functions and characteristic roots.
4. Explore graph theory concepts including connectivity, traversal algorithms, and shortest path problems.
5. Develop algorithmic thinking through the study of trees, spanning trees, and optimization techniques like Prim's and Kruskal's algorithms.

Course Outcomes: Upon successful completion of this course, students will be able to:

1. Demonstrate proficiency in propositional and predicate logic, including constructing valid arguments and applying inference rules.
2. Solve combinatorial problems using permutations, combinations, and the principle of inclusion-exclusion.
3. Formulate and solve recurrence relations using various methods including generating functions and substitution.
4. Apply graph theory to model real-world problems and implement algorithms for graph traversal and shortest path determination.
5. Utilize tree structures and spanning tree algorithms to optimize network design and data organization.

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Semester II

Subject Code: MCS 454	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 +70)**

Paper-IV: Computer Networks

Course Objectives: The Course aims to

1. Make understand the Computer Network Types, different Communication Protocols.
2. Understand different Networking Devices.
3. Impart Knowledge on Socket Programming.
4. Gain knowledge on the functions of different layers in OSI/TCP models.

Course Outcomes: After successful completion of this course, students will be able to

1. Describe basic computer network technology.
2. Explain different types of networks, OSI and TCP/IP reference models.
3. Identify the design issues, perform error detection and correction.
4. Understand the router architecture, IP and routing algorithms.
5. Analyze the various protocols used in respective layers of OSI reference model.
6. Understand the transport layer services, TCP and UDP protocols.
7. Understand the principles of the application layer protocols HTTP, FTP, SMTP and DNS.

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Semester II

Subject Code: MCS 484	
No. of credits	**1**
Instructional hours	**2 hrs/wk**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**25 marks**
Max.marks	**25**

Paper-V: Computer Networks Lab

Course Objectives: The Course aims to

1. To understand the working principle of various communication protocols.

2. To analyze the various routing algorithms.

3. To know the concept of data transfer between nodes

Course Outcomes: After successful completion of this course, students will be able to

1. Basic Networking programs to find category of IP address and Analyze various Congestion control mechanisms.

2. Demonstrate the Sockets creation, socket program using TCP & UDP

3. Develop simple applications using TCP & UDP

4. Develop the various Routing protocols

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Semester II

Subject Code: MCS 455	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**30 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**70 marks**
Max.marks	**100(30 +70)**

Paper--VI: Programming in Python

Course objectives: The Course aims to

1. Choose modern computing tools, skills and techniques necessary for innovative software solutions

2. Relate practical skills to provide solutions to industry, society and business.

3. Enumerate the creative ideas with the emerging technologies in real time applications.

4. Interpret complex business scenarios and contemporary issues in emerging technologies.

5. Classify the computing systems through quantitative and qualitative technique.

6. Associate techniques necessary for innovative software solutions.

Course Outcomes: After successful completion of this course, students will be able to

1. Explore Python language fundamentals, including basic syntax, variables, types,

2. Control statements and functions.

4. Apply python functions along with Python data structures - lists, tuples, dictionaries.

3. Illustrate function, Random Numbers and Modules.

5. Apply input/output with files and Illustrate OOPs concepts in python.

6. Illustrate GUI Programming using tkinter Module.

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Semester II

Subject Code: MCS 485	
No. of credits	**1**
Instructional hours	**2 hrs/wk**
Duration of Semester Examination	**2 Hrs**
Marks for Semester Examination	**25 marks**
Max.marks	**25**

Paper--VII: Programming in Python Lab

Course Objectives: The Course aims to

1. Provide hands on experience to develop core Programming skills using fundamental concepts.

2. Learn basic syntax and semantics, data structure like list, dictionaries etc.

3. Good knowledge on OOPs concepts and GUI Programming

Course Outcomes: After successful completion of this course, students will be able to

1. Understand the basic concepts scripting and the contributions of scripting language

2. Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, Process and sort the data.

3. Identify the external modules and import specific methods from them

4. Demonstrate proficiency in handling Strings and File Systems.

5. Ability to explore python especially the object oriented concepts, and the built in objects of Python

Demonstrate the GUI application development using tkinter module