

Shivaji University, Kolhapur

Name of Department: Mathematics

Name of Programme: M.Sc Tech Mathematics

Vision:
The vision of the Department is to be a premier institute of higher learning and research in Mathematics at National and International levels.
Mission:
To prepare excellent academicians and software developers to cater for the needs of academic institutes and industries.
Program Outcomes
<ol style="list-style-type: none">1. Demonstrate basic knowledge in fundamentals of programming, algorithms and programming technologies and fundamentals of Computer Science.2. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.3. Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.4. Communicate technical topics in written and verbal forms.5. Develop the ability to design creative solutions to real life problems faced by the industry.6. Improve the capability for self-learning.7. Map their qualities of learning to demonstrate latest technology.
Program Specific Outcomes
<ol style="list-style-type: none">1. Identify the central role of concurrency in systems programming and produce programs which generate and control a process, establish relationship and communication between multiple processes.2. Develop short system utilities and applications using system calls.3. To train the students to handle the differentiation and integration in higher dimensions.4. To study abstract structures.5. Design automata, regular expressions and context-free grammars for accepting or generating a certain language.

Course Outcomes		
Part-I Semester-I		
MTT 101	Advanced Calculus	<ol style="list-style-type: none"> 1. Analyze convergence of sequences and series of functions 2. check differentiability of functions of several variables 3. Apply inverse and implicit function theorems for functions of several variables 4. Use Green's Theorem, Stoke's Theorem, Gauss divergence Theorem.
MTT 102	Linear Algebra	<ol style="list-style-type: none"> 1. understand basic notions in Linear Algebra and use the results in developing advanced mathematics. 2. study the properties of Vector Spaces, Linear Transformations, Algebra of Linear Transformations and Inner product space in some details. 3. construct Canonical forms and Bilinear forms. 4. apply knowledge of Vector space, Linear Transformations, Canonical Forms and Bilinear Transformations.
MTT 103	Discrete Mathematical Structures -I	<ol style="list-style-type: none"> 1. learn formal logic as a theoretical foundation and its application to topics in discrete mathematics and computer science. 2. relate marriage problem to practical examples real life and solve it. 3. express the knowledge of logic and graph theory in the form of algorithms. 4. use this logic to develop various programming. 5. give the optimal solution to real problems. 6. develop simple networks for max flow.
MTT 104	Computer Architecture	<ol style="list-style-type: none"> 1. Use various metrics to calculate the performance of a computer system. 2. Identify the addressing mode of instructions 3. Determine which hardware blocks and control lines are used for specific instructions 4. Demonstrate how to add and multiply

		<p>integers and floating-point numbers using two's complement and IEEE floating point representation</p> <ol style="list-style-type: none"> Analyze clock periods, performance, and instruction throughput of single-cycle, multi-cycle, and pipelined implementations of a simple instruction set Detect pipeline hazards and identify possible solutions to those hazards Show how cache design parameters affect cache hit rate Map a virtual address into a physical address
MTT 105	Programming in C	<ol style="list-style-type: none"> Discover, understand and trace the execution of programs written in C language. Develop and analyze a problem Construct an algorithm to solve the problem Build functions to solve the given problem. Interpret pointers, structures and unions
MTT 106	Lab Work I	Objectives are to apply theory studied in computer based papers in the semester.
Part-I Semester-II		
MTT 201	Functional Analysis	<ol style="list-style-type: none"> understand the fundamental topics, principles and methods of functional analysis. demonstrate the knowledge of normed spaces, Banach spaces, Hilbert space. define continuous linear transformations between linear spaces, bounded linear functionals. apply finite dimensional spectral theorem. identify normal, self adjoint, unitary, Hermitian operators.
MTT 202	Algebra	<ol style="list-style-type: none"> study group theory and ring theory in some details. introduce and discuss module structure over a ring. apply Sylow theorems. use homomorphism and isomorphism theorems. check irreducibility of polynomials over \mathbb{Q}

		using Eisenstein criteria.
MTT 203	Discrete Mathematical Structures -II	<ol style="list-style-type: none"> 1. understand applications of discrete mathematics including lattices, Boolean algebra and its applications. 2. develop the logic to use the Boolean algebra for switching circuits. 3. prove The Myhill-Nerode theorem. 4. understand the terminology, operations, and symbols of finite state automata and minimum language accepted. 5. use Pushdown Automata and Context-free Languages for programming.
MTT 204	Data Structures Using C	<ol style="list-style-type: none"> 1. Develop Programs using functions and Pointers 2. Write C programs using structures, unions, dynamic memory allocation functions and command line arguments 3. Describe and simulate various linear data structures like stacks, queues, linked lists using static and dynamic allocation and use them in solving problems. 4. Simulate nonlinear data structures like binary search tree and threaded binary trees and use them in designing applications like sorting, expression trees etc. 5. Explain the various algorithms for sorting and searching 6. Demonstrate the indexing techniques in data structures
MTT 205	Operating Systems	<ol style="list-style-type: none"> 1. Describe process management and concepts of threading, multitasking, IPC. 2. Differentiation of various scheduling algorithms and identify the reasons of deadlock and their remedial measures in an operating system. 3. Explain various memory management techniques. 4. Know the components and management aspects of concurrency management

		<p>5. Understand representation of file system interface.</p> <p>6. Learn programmatically to implement simple OS mechanisms</p>
MTT 206	Lab Work II	Objectives are to apply theory studied in computer based papers in the semester.
Part-II Semester-III		
MTT 301	Complex Analysis	<p>1. compute the region of convergence for power series,</p> <p>2. prove the Cauchy-Riemann equations and apply them to complex functions in order to examine differentiability and analyticity of complex functions,</p> <p>3. evaluate complex integration along the curve via Cauchy's theorem and integral formula</p> <p>4. prove the Cauchy residue theorem and apply it to several kinds of real integrals.</p> <p>5. compute the Taylor series and Laurent series expansions of complex functions and apply it to for checking the nature of singularities and calculating residues,</p> <p>6. demonstrate accurate and efficient use of complex analysis techniques to solve the problems in physics, engineering and other mathematical contexts</p>
MTT 302	Ordinary Differential Equations	<p>1. solve ordinary differential equations with constant coefficients.</p> <p>2. check linear independence of functions.</p> <p>3. construct solutions of ordinary differential equations with variable coefficients.</p> <p>4. calculate power series solutions.</p> <p>5. identify and classify singularities.</p> <p>6. generate approximate solutions.</p>
MTT 303	Design and Analysis of Algorithms-I	<p>1. Apply the algorithms and design techniques to solve problems. Students will able to compare two algorithms in terms of time and space complexity</p> <p>2. Study and implement different searching and</p>

		<p>sorting techniques</p> <p>3. Study and Solve Problem using Dynamic Programming and Greedy Method Algorithms</p> <p>4. Students learn advanced data structure and basics of graphs traversal problems</p>
MTT 304	Database Systems	<p>1. classify database management system concepts and different data models.</p> <p>2. describe fundamental elements of relational data models and master the basics of SQL.</p> <p>3. understand the concepts of integrity, security and normalization approach.</p> <p>4. develop skills for query processing and optimization.</p> <p>5. identify the basic issues of transaction processing.</p> <p>6. demonstrate concepts of concurrency control and recovery system.</p>
MTT 305	Object Oriented Programming with C++	<p>1. understand the features of C++ supporting object oriented programming</p> <p>2. compare the procedural and object-oriented paradigm with concepts of streams, classes, functions, data, and object</p> <p>3. design, implement, test, debug, and document programs in C++</p> <p>4. implement dynamic memory management techniques using pointers, constructors, destructors</p> <p>5. classify inheritance with the understanding of early and late binding</p> <p>6. demonstrate exception handling, generic programming</p>
MTT 306	Lab Work III	Objectives are to apply theory studied in computer based papers in the semester.
Part-II semester-IV		
MTT 401	Real Analysis	<p>1. generalise the concept of length of interval.</p> <p>2. analyse the properties of Lebesgue measurable sets.</p> <p>3. demonstrate the measurable functions and</p>

		<p>their properties.</p> <p>4. understand the concept of Lebesgue integration of measurable functions.</p> <p>5. characterize Riemann and Lebesgue integrability.</p> <p>6. prove completeness of L^p Spaces.</p>
MTT 402	Operations Research	<p>1. Recognize convex sets and convex functions.</p> <p>2. Calculate maximum and minimum value of a function of several variables.</p> <p>3. Solve LPP by simplex and dual simplex methods.</p> <p>4. Construct codes, efficiency and redundancy in Encoding</p> <p>5. Find optimal value of nonlinear objective function subject to constraints.</p>
MTT 403	Design and Analysis of Algorithms II	<p>1. Study and understand basics of parallel Algorithms</p> <p>2. Study and solve String marching, geometric algorithm problem</p> <p>3. Understand the various techniques related to transformation and modular arithmetic and encryption</p> <p>4. Study and Summarize concept of Lower Bound, NP Hard and NP Complete Problems</p>
MTT 404	PHP with MySQL	<p>1. Students will be equipped with principles, knowledge and skills for the design and construction of Website and Web Application Development using Open Source Language PHP.</p> <p>2. On completion of this course, a student will be able to develop a web application using PHP technologies.</p> <p>3. Students will demonstrate the skills and project-based experience needed for entry into web application and development careers.</p> <p>4. Students will be able to compare multiple web technologies to create advanced, dynamic & effective website by the using of HTML, Java script,</p>

		MySQL, CSS and PHP. 5. Students will acquire knowledge and Skills for creation of Web Site using PHP and MySQL.
MTT 405	Java Programming	1. understand basic concepts of Java such as operators, classes, objects, inheritance, packages, enumeration and various keywords 2. Identify classes, objects, members of a class and relationships among them needed for a specific problem 3. demonstrate the concepts of polymorphism and inheritance 4. implement Exceptional handling mechanism 5. design applications of Java using Java applet, Event Handling, Abstract Window Toolkit and database connectivity
MTT 406	Lab Work IV	Objectives are to apply theory studied in computer based papers in the semester.
Part-III semester-V		
MTT 501	Advanced Web Technology	1. develop windows form application using C# 2. Understand client-server architecture 3. Develop web form application using ASP.NET 4. Develop application using MVC
MTT 502	Software Engineering	1. Understand various models of Software Development. 2. Understand requirement gathering and requirement modeling. 3. Explore concepts and models in software design. 4. To understand the testing and debugging methods for software.
MTT 503	Computer Networks	1. Understand basic computer network technology. 2. Identify the different types of network topologies and protocols. 3. Understand the basic protocols of computer

		<p>networks, and how they can be used to assist in network design and implementation.</p> <ol style="list-style-type: none"> 4. Understand and study transport layer protocols and basics of cellular network 5. Identify and study application layer protocols
MTT 504	Cyber Security	<ol style="list-style-type: none"> 1. Realize the need for Cyber Security 2. Understand the need for Security in day to day communications 3. Understand the vulnerabilities in the Network and Computer System 4. Understand the cyber law and Cyber Forensics
MTT 505(1)	Compiler Techniques	<ol style="list-style-type: none"> 1. Initiate an understanding of phases of compiler and lexical analysis. 2. Understand how compiler performs syntax analysis using grammar. 3. Explore how intermediate code generated and syntax directed translation occurs. 4. To understand the code optimization and code generation techniques.
MTT 505(2)	Linux Operating System	<ol style="list-style-type: none"> 1. Understand basic concept of operating system and system calls. 2. Understand and able to perform the basic set of commands and utilities in Linux/UNIX systems. 3. able to create file systems and directories and operate them understand and able to write shell script and understand basics of system administration
MTT 505(3)	Android Programming	<ol style="list-style-type: none"> 1. Install and configure Android application development tools. 2. Describe Android platform, Architecture and features. 3. To learn activity creation and Android UI designing. 4. Design User Interface and develop activity for Android App. 5. Use Intent, Broadcast receivers and Internet services in Android App.

		6. Design and implement Database Application and Content providers.
MTT 505(4)	Machine Learning	<ol style="list-style-type: none"> 1. learn the basic concepts, techniques and applications of machine learning 2. become familiar with regression methods, classification methods, clustering methods. 3. become familiar with Dimensionality reduction Techniques. 4. understand the range of machine learning algorithms along with their strength and weakness
MTT 506	Lab Work V	Objectives are to apply theory studied in computer based papers in the semester.
Part-III semester-VI		
MTT 601	A. Industrial Project	
MTT 601	B. Technical Communication	