

**Shivaji University, Kolhapur**  
**Department of Computer Science**  
**Name of Programme: Master of Computer Science (M.Sc.)**

<b>Vision</b>		
To impart training to analyze problems and develop human resources in order to produce computer Professionals, academics and researchers.		
<b>Mission</b>		
To train students for fundamental and advanced programming techniques right from essential mathematics and managerial science to high performance computing and soft computing.		
<b>Program Outcomes</b>		
<ol style="list-style-type: none"> <li>1. Communicate computer science concepts, designs, and solutions effectively and professionally</li> <li>2. Apply knowledge of computing to produce effective designs and solutions for specific problems</li> <li>3. Identify, analyse, and synthesize scholarly literature relating to the field of computer science.</li> <li>4. Use software development tools, software systems, and modern computing platforms.</li> <li>5. Prepare for academic roles through NET/SET/PhD</li> <li>6. Apply design and development principles in the construction of software systems of varying complexity.</li> </ol>		
<b>Program Specific Outcomes</b>		
<ol style="list-style-type: none"> <li>1. Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.</li> <li>2. Ability to understand the structure and development methodologies of software systems. Possess professional skills and knowledge of software design process.</li> <li>3. Familiarity and practical competence with a broad range of programming language and open source platforms.</li> <li>4. Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems.</li> </ol>		
<b>M.Sc. Part I - Semester I</b>		
CS2111	Theory of Languages	<ol style="list-style-type: none"> <li>1..Define languages by abstract, recursive definitions and by regular expressions.</li> <li>2. Design a finite automaton to recognize a given regular language.</li> <li>3. Transform a language into regular expression or finite automaton or transition graph.</li> <li>4. Define deterministic and nondeterministic finite automata.</li> <li>5. Prove properties of regular languages and classify</li> </ol>

		<p>them.</p> <ol style="list-style-type: none"> <li>6. Determine decidability, finiteness and equivalence properties.</li> <li>7. Define relationship between regular languages and context-free grammars.</li> <li>8. Building a context-free grammar for pushdown automata.</li> <li>9. Determine whether a given language is context-free language or not.</li> <li>10. Prove properties of context-free languages.</li> <li>11. Design Turing machine for a given language.</li> <li>12. Discuss the concept of computability.</li> </ol>
CS2112:	Advanced Computer Networks	<ol style="list-style-type: none"> <li>1. . Analyze the basics of data communications and network architecture.</li> <li>2. Analyze functions of each layer of a computer network.</li> <li>3. Evaluate essential features of specific protocols in the common protocol suite.</li> <li>4. Analyze the methodology and the rationale behind addressing, routing, and congestion control.</li> <li>5. Understand various multiplexing and switching methods used in networks.</li> <li>6. Evaluate wireless LANs, high-speed digital access, such DSL and cable modem, cellular phone, and satellite networks.</li> </ol>
CS2113	Advanced Data Base Theory	<ol style="list-style-type: none"> <li>1. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.</li> <li>2. Master the basic concepts and appreciate the applications of database systems</li> <li>3. Demonstrate an understanding of the relational data model.</li> <li>4. Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.</li> <li>5. Use a desktop database package to create, populate, maintain, and query a database.</li> <li>6. Be familiar with the relational database theory, and be able to write relational algebra expressions for queries</li> <li>7. Formulate, using SQL, solutions to a broad range of query and data update problems.</li> </ol>

		<ol style="list-style-type: none"> <li>8. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.</li> <li>9. Define the terminology, features, classifications, and characteristics embodied in database systems.</li> <li>10. Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.</li> <li>11. Use a desktop database package to create, populate, maintain, and query a database.</li> <li>12. Formulate, using SQL, solutions to a broad range of query and data update problems.</li> </ol>
CS2114	Design and Analysis of Algorithms	<ol style="list-style-type: none"> <li>1. Analyze the asymptotic performance of algorithms.</li> <li>2. Demonstrate a familiarity with data structures and algorithms.</li> <li>3. Employ graphs to model real life problems, when appropriate. Develop algorithms that employ graph computations as key components, and analyze them.</li> <li>4. Mapping of data structures like Stack, Queue and Linked List to real life problems.</li> <li>5. Master the implementation of linked data structures such as linked lists and binary trees.</li> <li>6. Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues, Red-Black trees, Btrees.</li> <li>7. Understand and apply several searching and sorting algorithms including quicksort, Merge-Sort and Heap-Sort.</li> <li>8. Be familiar with some graph algorithms such as shortest path and minimum spanning tree</li> <li>9. Students learn to analyze and compare algorithms for efficiency using Big-O notation</li> </ol>
CS2131	Web designing	<ol style="list-style-type: none"> <li>1. To analyze structure of web and working of web site.</li> <li>2. To familiar with graphic design principles that relate to web design and learn how to implement these theories into practice.</li> <li>3. To understand the principles of creating an effective web page, including an in-depth</li> </ol>

		<p>consideration of information technology.</p> <ol style="list-style-type: none"> <li>4. To understand basic as well as advance HTML tags</li> <li>5. Student will be able to design and develop web pages using CSS styles, internal and/or external style sheets.</li> </ol>
CS2115	Data Base Lab	<ol style="list-style-type: none"> <li>1. Demonstrate an understanding of the relational data model.</li> <li>2. Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.</li> <li>3. Formulate, using relational algebra, solutions to a broad range of query problems.</li> <li>4. Formulate, using SQL, solutions to a broad range of query and data update problems.</li> <li>5. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.</li> <li>6. Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.</li> <li>7. Use a desktop database package to create, populate, maintain, and query a database.</li> <li>8. Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.</li> </ol>
CS2116	DAA and TL Lab	<ol style="list-style-type: none"> <li>1. Implement basic Data structures like Stack, Queue Linked List using C++</li> <li>2. Solve simple arithmetic expressions using Stack</li> <li>3. Understand elimination of Recursion using stack by implementing it</li> <li>4. Demonstrate implementation of Binary Search trees using Linked List.</li> <li>5. Simulation of Deterministic Finite Automata</li> <li>6. Implementation of Push Down Automata</li> <li>7. Simulation of Turing Machine</li> </ol>
<b>M.Sc. Part I</b>		
<b>Semester II</b>		
		<ol style="list-style-type: none"> <li>1. Develop fluency in describing the theory and</li> </ol>

CS2211:	Compiler Techniques	<p>practice of compilation, in particular, the lexical analysis, syntax, and semantic analysis, code generation and optimization phases of compilation.</p> <ol style="list-style-type: none"> <li>2. To design lexical rules and grammars for a programming language.</li> <li>3. Implement a parser such as a bottom-up SLR parser.</li> <li>4. Ability to implement semantic rules into a parser that performs attribution while parsing.</li> <li>5. Learn to design a compiler for a concise programming language.</li> </ol>
CS2212	Artificial Intelligence	<ol style="list-style-type: none"> <li>1. Apply problem solving by intelligent search approach.</li> <li>2. Represent knowledge using AI knowledge representation techniques.</li> <li>3. Design Machine Learning solution to real life problems.</li> <li>4. Derive solutions for problems with uncertainty using Fuzzy theory</li> </ol>
CS2213	Java Programming	<ol style="list-style-type: none"> <li>1. This course covers topics JVM, JavaBeans, RMI, Hibernate, JDBC, Servlet &amp; CORBA. After completing this course, the student will be able to develop distributed business applications, develop web pages using advanced server-side programming through Servlets and Java server page.</li> <li>2. In addition, the student will be able to demonstrate approaches for performance and effective coding and Develop Java client/server applications.</li> <li>3. It develops advanced Java programming skills that are required to fully utilize the capabilities of this object-oriented, general-purpose programming language.</li> <li>4. At the end of course students will develop Swing-based GUI, Develop client/server applications.</li> <li>5. Using JDBC concept they can learn database concepts in depth and perform all CRUD operations easily.</li> <li>6. Develop distributed applications using RMI.</li> <li>7. Develop component-based Java software using JavaBeans Using Servlet and JSP they can develop dynamic web pages</li> </ol>
	Computer	<ol style="list-style-type: none"> <li>1. Familiarizing with multiprocessor and</li> </ol>

<p>Elective –I CS222</p>	<p>Architecture</p>	<p>interconnection structure.</p> <ol style="list-style-type: none"> <li>2. To understand how basic computers and accumulators are design.</li> <li>3. Familiarizing with instruction codes, instruction cycles and memory reference instruction.</li> <li>4. To know about the input output organization.</li> <li>5. To understand the in depth architecture and organization of a modern computer with its various processing units.</li> <li>6. To know the memory hierarchy and management system of computer</li> <li>7. To familiarize with Issues that affect the modern processors i.e. caches, pipelines</li> </ol>
<p>Elective –I CS222</p>	<p>Data Warehouse</p>	<ol style="list-style-type: none"> <li>1. Understand the basic concepts of a data warehouse</li> <li>2. Define the various architectures and main components of a data warehouse</li> <li>3. Understand the role of metadata in the data warehouse</li> <li>4. Understand the difference between a star and snowflake schema</li> <li>5. Describe methods and tools for extracting, transforming and loading data.</li> </ol>
<p>Elective –I CS222</p>	<p>Network Security</p>	<ol style="list-style-type: none"> <li>1. To understand different security services and mechanisms.</li> <li>2. Familiarizing with secrete key cryptography and encryption.</li> <li>3. Understand different authentication techniques.</li> <li>4. Familiarizing with different Security Policies and Security Handshake Pitfalls.</li> <li>5. To know about Kerberos protocol and security for electronic commerce.</li> </ol>
<p>CS2214</p>	<p>Java Lab</p>	<ol style="list-style-type: none"> <li>1. Define &amp; explain applet Life cycle</li> <li>2. Differentiate local and remote applet</li> <li>3. Write the code for a simple Java applet</li> <li>4. Explain applet tag and its parameter</li> <li>5. Use the methods of the Applet and Component classes required for a basic applet</li> <li>6. Describe the classes in the AWT package that relate to the Applet class</li> <li>7. Describe the AWT graphics explain controls and how to apply them in the container</li> <li>8. Develop simple programs using Event class and</li> </ol>

		<p>Event Listener Interface</p> <ol style="list-style-type: none"> <li>9. Develop a program for steps to connect a database</li> <li>10. Describe the Basics of JDBC</li> <li>11. Explain the different Types of JDBC drivers &amp; their advantages and Disadvantages</li> <li>12. Develop program to use JDBC to query a database and modify</li> <li>13. Describe life cycle of servlet</li> <li>14. Develop program using javax.servlet package</li> <li>15. Explain JSP Architecture and its Life cycle</li> </ol> <p>Develop simple program</p>
CS2215	Project	<ol style="list-style-type: none"> <li>1. Gain skills as they apply knowledge effectively in diverse contexts.</li> <li>2. Analyse and model requirements and constraints for the purpose of designing and implementing software artefacts and IT systems</li> <li>3. Design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modelling or requirements specification</li> <li>4. Present a clear, coherent and independent exposition of software applications, alternative IT solutions, and decision recommendations to both IT and non-IT personnel via technical reports of professional standard and technical presentations.</li> <li>5. Team work: Work effectively in different roles, to form, manage, and successfully produce outcomes from teams, whose members may have diverse cultural backgrounds and life circumstances, and differing levels of technical expertise.</li> </ol>
CS2231	CBCS (Comp.Sci / Other Dept.) Software Engineering	<ol style="list-style-type: none"> <li>1. Knowledge of basic SW engineering methods and practices, and their appropriate application.</li> <li>2. A general understanding of software process models such as the waterfall and evolutionary models.</li> <li>3. Understanding of software requirements and the SRS documents.</li> <li>4. Understanding of the role of project management including planning, scheduling, risk management,</li> </ol>

		<p>etc.</p> <ol style="list-style-type: none"> <li>5. Understanding of implementation issues such as modularity and coding standards.</li> <li>6. Understanding of approaches to verification and validation including static analysis, and reviews.</li> <li>7. Understanding of software testing approaches such as unit testing and integration testing.</li> <li>8. Describe software measurement and software risks.</li> <li>9. Understanding of software evolution and related issues such as version management</li> </ol>
<b>M.Sc. Part II - Semester III</b>		
CS2311	Internet Programming	<ol style="list-style-type: none"> <li>1. Debug and deploy ASP.NET web applications</li> <li>2. Discuss the insights of internet programming and implement complete application over the web</li> <li>3. Use the features of Dot Net Framework along with the features of C#</li> <li>4. Build and host web applications using ASP.NET</li> <li>5. Develop and deploy Windows applications</li> <li>6. Handle data by using ADO.NET architecture</li> <li>7. Create database-driven ASP.NET web applications and web services</li> <li>8. Handle various toolkit like AJAX</li> </ol>
CS2312	Computer Graphics	<ol style="list-style-type: none"> <li>1. To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components</li> <li>2. To learn the basic principles of 2 and 3-dimensional computer graphics.</li> <li>3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.</li> <li>4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.</li> <li>5. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.</li> <li>6. To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.</li> </ol>
		<ol style="list-style-type: none"> <li>1. Introduce the broad perceptive of cloud architecture and model</li> </ol>



<p>Elective Paper- XI (CS2313)</p>	<p>Cloud computing</p>	<ol style="list-style-type: none"> <li>2. Apply different cloud programming model as per need.</li> <li>3. Explore some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications</li> <li>4. To learn how to use Cloud Services.</li> <li>5. To implement Task Scheduling algorithms.</li> <li>6. To build Private Cloud.</li> </ol>
<p>Elective Paper- XI (CS2313)</p>	<p>Distributed O.S.</p>	<ol style="list-style-type: none"> <li>1. To gain knowledge on distributed operating system concepts that includes architecture,</li> <li>2. Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols</li> <li>3. To know the components and management aspects of concurrency management</li> <li>4. Analyse the various device and resource management techniques for timesharing and distributed systems</li> <li>5. Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system</li> <li>6. Interpret the mechanisms adopted for file sharing in distributed Applications</li> <li>7. Conceptualize the components involved in designing a contemporary OS</li> </ol>
<p>Elective Paper- XI (CS2313)</p>	<p>Data Mining</p>	<ol style="list-style-type: none"> <li>1. To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting-edge technology for building competitive advantage.</li> <li>2. To enable students to effectively identify sources of data and process it for data mining</li> <li>3. To make students well versed in all data mining algorithms, methods of evaluation.</li> <li>4. To impart knowledge of tools used for data mining</li> <li>5. To provide knowledge on how to gather and analyze large sets of data to gain useful business understanding.</li> <li>6. To impart skills that can enable students to approach business problems analytically by identifying opportunities to derive business</li> </ol>
<p>Elective</p>	<p>OPEN SOURCE</p>	<ol style="list-style-type: none"> <li>1. This design course will equip students with principles, knowledge and skills for the open</li> </ol>

Paper- XI (CS2313)	SOFTWARES	<p>source software because today open source software has become critical for almost every organization. From telecommunication systems, inventory, accounting, personal productivity applications, contact management to the operating systems area covered by open source now.</p> <ol style="list-style-type: none"> <li>2. This course will prepare students to develop software in and for Linux/UNIX environments.</li> <li>3. On completion of this course, a student will be able to develop a web application using PHP technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers.</li> <li>4. Conceptualize and plan an internet-based business that applies appropriate business models and web technologies.</li> <li>5. Incorporate best practices in navigation, usability and written content to design websites that give users easy access to the information they seek.</li> </ol>
CS2315	Internet programming Lab	<ol style="list-style-type: none"> <li>1. To develop a dynamic webpage by the use of ASP.NET</li> <li>2. To write a well formed / valid XML document.</li> <li>3. To connect web form to a MS SQL Server and perform insert, update and delete operations on DBMS table.</li> <li>4. To use state management techniques available in asp.net</li> <li>5. To use all the validation controls</li> <li>6. To apply CSS to the webpages</li> <li>7. Use scripting languages and web services to transfer data and add interactive components to web pages</li> <li>8. Use fundamental skills to maintain web server services required to host a website</li> </ol>
CS2316:	Computer graphics Lab	<ol style="list-style-type: none"> <li>1. To implement various graphics drawing algorithms</li> <li>2. To implement various polygon filling techniques</li> <li>3. Implementation of 2D and 3D transformations along with clipping techniques.</li> <li>4. To generate different types of curves.</li> </ol>
CS2317	Project	<ol style="list-style-type: none"> <li>1. Gain skills as they apply knowledge effectively in diverse contexts.</li> </ol>

		<ol style="list-style-type: none"> <li>2. Analyse and model requirements and constraints for the purpose of designing and implementing software artefacts and IT systems</li> <li>3. Design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modelling or requirements specification</li> <li>4. Present a clear, coherent and independent exposition of software applications, alternative IT solutions, and decision recommendations to both IT and non-IT personnel via technical reports of professional standard and technical presentations.</li> <li>5. Team work: Work effectively in different roles, to form, manage, and successfully produce outcomes from teams, whose members may have diverse cultural backgrounds and life circumstances, and differing levels of technical expertise.</li> </ol>
CS2231	Software Project Management (CBCS)	<ol style="list-style-type: none"> <li>1. This design course will equip students for making successful careers in software engineering and software project management with a thorough understanding of software project management concepts which will be opportunities to apply that knowledge to solve real-world problems.</li> <li>2. The program will prepare students to be successful professionals in the field with solid fundamental knowledge of software project management like, Project management, Risk Management, Software Project Estimation, Configuration Management, Software Quality Management and Testing.</li> <li>3. Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes.</li> <li>4. It will help to demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle and project management.</li> <li>5. It will help to demonstrate an ability to use the techniques and tools necessary for engineering practice.</li> </ol>
<b>M.Sc. Part II - Semester IV</b>		

CS241	Research/Industrial Project	<p>On successful completion of the course students will be able to</p> <ol style="list-style-type: none"> <li>1. Demonstrated their ability to work independently and collaboratively</li> <li>2. To have hands-on experience in the students' related field so that they can relate and reinforce what has been taught at the university.</li> <li>3. To promote cooperation and to develop synergetic collaboration between industry and the university in promoting a knowledgeable society</li> <li>4. Developed their abilities in problem solving and critical judgment</li> <li>5. Demonstrated their ability to effectively collect, analyze and organize scientific information</li> <li>6. To expose students to the real working environment and get acquainted with the organization structure, business operations and administrative functions.</li> <li>7. To utilize technical resources</li> <li>8. Expose the students to the actual working environment including rules, regulations and safety practices.</li> </ol>
CS2412	Research seminar	<ol style="list-style-type: none"> <li>1. Review research papers with some understanding.</li> <li>2. Identify good research literature</li> <li>3. To Generate a report based on the experiences and projects carried out with the ability to apply knowledge of recent trends</li> <li>4. To present their research work in suitable format</li> <li>5. To learn research methodologies available</li> <li>6. To use standard paper format required during publication.</li> </ol>