

**GOVT. HOLKAR [MODEL, AUTONOMOUS] SCIENCE
COLLEGE INDORE**
Academic Year 2024-2025



Affiliated to Devi Ahilya Vishwavidyalaya, Indore

Syllabus for M.Sc.

Computer Science

(Faculty of Computer Science)

DEPARTMENT OF COMPUTER SCIENCE

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DEPARTMENT OF COMPUTER SCIENCE

M.Sc. Computer Science

Academic Year 2024-2025

Govt. Holkar (Model Autonomous) Science College, Indore

Computer Science Department

Syllabus Session 2024-25

Programme: M.Sc. Computer Science

Class :M.Sc. III Sem.

S.N o.	Paper	Course Title	Course Code	Credits	CCE (Max)	CCE (Min.)	External Assessment Max.	External Assessment Min.	Total Max.	Total Min.
1	Core 9	Object Oriented Programming using JAVA	CS31	4	25	9	75	26	100	35
2	Core 10	Database Applications and Tools	CS32	4	25	9	75	26	100	35
3	Elective 1/1	Theory of Computation	CS33 -A	4	25	9	75	26	100	35
	Elective 1/2	Computer Architecture	CS33 -B							
4	Elective 2/1	Software Engineering	CS34- A	4	25	9	75	26	100	35
	Elective 2/2	Linux/ UNIX Administration	CS 34- B							
5	Open Elective (Inter disciplinary)	Paper 13 (out of given group)		4	25	9	75		100	35
5	Practical 5	Practical based on Theory paper 9 & 10		3			75		75	26
6	Practical 6	Practical based on Theory paper 1 & 2 (Elective)		3			75		75	26
				26	125		525		650	

Mr. Mohit Gupta
Student
Clause 06

Mr. Manish Kumar
Industrial Person
Clause 05

Dr. Ugrasen Suman
Subject Expert
Clause 04

Dr. Sharad Gangele
Subject Expert
Clause 03

Dr. Sanjeev Sharma
Subject Expert
Clause 03

Dr. Pradeep Sharma
Convener & HoD

M.Sc. III Semester Department of Computer Science, GHSC, Indore

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Open Elective Paper –

Name of Department responsible for framing of syllabus	Title of Paper
Bioinformatics	Basic of Bioinformatics
Biochemistry	Biochemical Techniques
Geology	Remote sensing
Botany	Environment Biology
Microbiology	Basic of Microbiology
Mathematics	Mathematical Modeling
Computer Science	Computer Application
Statistics	Bio- Statistical Techniques
Chemistry	Research Methodology
Language (English)	Communication Skills
Respective Departments	In-house Project

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M.Sc. (CS) III -Semester
CS 31: Object Oriented Programming using Java
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

1. The students will have the competence in the use of Java Programming language.
2. The development of small to medium sized application programs that demonstrate professionally acceptable coding.
3. An understanding of the principles and practice of object-oriented programming in the construction of robust maintainable programs which satisfy the requirements.
4. Design and implement an application that demonstrates their competency with Java syntax, structure and programming logic, incorporating basic features of the language as well as some features from the I/O (Input/Output) or GUI libraries.
5. Competence in the use of Java Programming language in the development of small to medium sized application programs that demonstrate professionally acceptable coding and performance standards.

Unit	Topic
I	Introduction to Java: Features of Java, Object-oriented programming overview, Introduction of Java Technologies, How to write simple Java programs, Data Types, Variables & Arrays, Naming Conventions. Type conversion & casting, Operators, Control Statements, Selection Statements, Iteration Statements, Jump Statements. String Handling: The String constructors, String operators Character Exaction, String comparison, String Buffer.
II	Introducing Class: Class fundamentals, Declaring objects, Introducing methods, Constructors, Garbage collection, Overloading methods, Parameter passing, Nested and Inner class. Inheritance: Basic, Using super, Method overriding, Dynamic Method Dispatch, Abstract classes, The Object class.
III	Packages and Interfaces: Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, defining an Interface, Achieving multiple inheritance through interfaces, Variables in Interfaces. Exception Handling: Exception handling fundamentals, Exception types, Using try and catch, Multiple catch and nested try, Throw, throws and finally, Creating own exception classes. Multithreading: What are threads, The java thread model, Thread priorities, Thread life cycle, Creating thread, Creating multiple threads, Thread Groups, Synchronization, Inter-thread Communication.
IV	Streams and Files: Files and Streams. Introduction To Swing: Overview of swing Components, Event Handling, Layout managers. Applets: Applet basics, Applet Architecture, Applet skeleton, Applet HTML Tag and

	attributes, Passing parameters to Applets.
V	Database connectivity: JDBC, The design of JDBC, Typical uses of JDBC, The Structured Query language, Basic JDBC Programming concepts, Executing Queries. Introduction to Generic and Collection API.

Required Text(s)

- Deitel & Deitel ,JAVA How to Program, 6th Edition , Pearson Education.
- Herbert Schildt ,The Complete Reference JAVA 2, 4th Edition , Tata McGraw-Hill.
- John Hubbard, Schaum's Easy outline: Programming with Java .
- JAVA 2 Black Book.
- Bruce Eckel ,Thinking in Java by Bruce Eckel , Prentice Hall.
- Gary Cornell, Cay Horstmann ,Core Java 1.2: Volume I Fundamentals by Gary Cornell, Cay Horstmann, Prentice Hall.

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M.Sc. (CS) III -Semester
CS 32: Database Applications and Tools
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

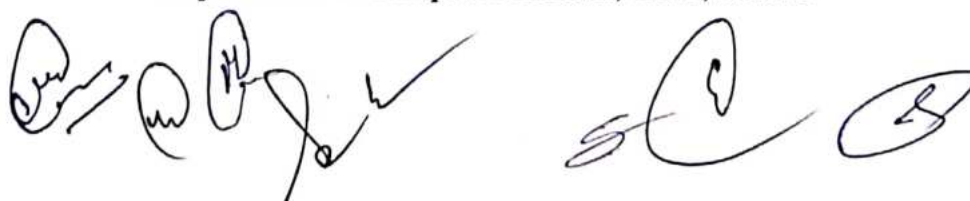
Course Outcomes:

1. Eliminate redundant data.
2. Make access to the data easy for the user.
3. Provide for mass storage of relevant data.
4. Protect the data from physical harm and un-authorized systems.
5. Allow for growth in the data base system and Maintaining Warehouse.

Unit	Topic
I	Database Development Process: Database Development within information Systems Development, Information System Architecture, Information Engineering, Information System Planning, Database Development Process, System Development Lifecycle.
II	Database Analysis: Modeling Data in Organization, ER Model and ER Model Constructs, EER Models and EER Models Constructs, case study.
III	Logical and Physical Design of Database System: Relational Data model, Transforming EER into Relations, Normalization, Designing Fields, Choosing Data Types, Choosing Data Integrity, Designing Physical Records and De-normalization.
IV	Designing Physical Files: File Organizations, Sequential File Organization, Indexed File Organization, Hashed File Organization, RAID, Query Processing and Optimization.
V	Advanced Topics(Overview) : Data Warehousing, Data Mining, Distributed Databases, Object Oriented databases, Object Relational Databases, Case Study.

Required Text(s)

- Jeffrey A. Hoffer, Mary Prescott, Fred McFadden, Modern Database Management, 8th Edition, Pearson Education.
- Thomas M. Connolly, Carolyn E. Begg, Data Base System: A Practical approach to Design, Implementation and Management, 4th edition, Addition Wesley, 2004.



M.Sc. (CS) III -Semester
CS 33 - A: Theory of Computation
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages.
2. To illustrate finite state machines to solve problems in computing.
3. To explain the hierarchy of problems arising in the computer sciences.
4. To solve various problems of applying normal form techniques, push down automata and Turing Machines.
5. To familiarize Regular grammars, context free grammar.

Unit	Topic
I	Introduction: Grammars and Languages, Context Free and Context Sensitive Languages. Programs, Languages and Parsing, Phrase Structure Grammars and their classification. Chomsky Hierarchy, Closure Properties.
II	Theory of Automata: Finite Automata, Deterministic Finite Acceptors- Transition Graphs, Languages and DFAs, Regular Languages, Non-Deterministic Finite Acceptors. Equivalence of Deterministic and Non-deterministic Finite Acceptors, Mealy and Moore models-Definitions, Transformation of Mealy Machine into Moore Machine and vice-versa. Minimization of Finite Automata – Definition and Construction.
III	Regular Languages: Regular Expressions, Connection between Regular Expressions and Regular Languages. Regular Grammars – Right and Left Linear Grammars, Equivalence between Regular Languages and Regular Grammars.
IV	Context-Free Languages : Context-Free Grammars- Leftmost and Rightmost Derivations, Derivation Trees, Parsing and Ambiguity, Simplification of CFGs. Chomsky Normal Form, Greibach Normal Form, Cockie-Kasami-Younger Algorithm. Properties of Context-Free Languages.
V	Pushdown Automata : Definition, Nondeterministic Pushdown Automata, Pushdown Automata for Context Free Languages. Context-Free Grammars for Pushdown Automata. Deterministic Pushdown Automata and Deterministic Context-Free Languages. Turing Machines: Definition of standard Turing Machine, Turing Machine as Language Acceptors and Transducers.

Required Text(s):

- Mishra and Chandrasekaran, Theory of Computer Science, Prentice Hall of India.
- Hopcraft and Ullman, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House.
- John E. Hopcroft , Rajeev Motwani , Jeffrey D. Ullman , Introduction to Automata Theory, Languages, and Computation ,3rd Edition,Addison Wesley, 2006.
- Moll, Arbib and Kfoury, An Introduction to Formal Language Theory. Springer-Verlag.
- Peter Linz, An Introduction to Formal Languages and Automata, Narosa Publishing House

M.Sc. (CS) III -Semester
CS33-B: Computer Architecture
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To identify the elements of modern instructions sets and their impact on processor design.
4. To explain the function of each element of a memory hierarchy.
5. To identify and compare different methods for computer I/O.

Unit	Topic
I	Technological trends, measuring performance, Amdahl's law. Basic structure of computer hardware: Functional units and components in computer Organization: The memory unit, the input and output subsystem, the bus structures, ALU. Program development tools: Compiler, interpreter, assembler.
II	Instruction sets and processor organizations: Instruction and Interrupt Cycles, Instruction Sequencing, Addressing Modes. Instruction set. 8088 microprocessor: Architecture. 8088 Assembly language programming.
III	Processing unit design: Processor micro architecture I - fundamental concepts of data path Implementation. Processor micro architecture II- data path implementation, Hardwired control Unit, micro programmed Execution.
IV	Instruction pipelining and parallel processing: Instruction pipelining hazards, Instruction set Design influence on pipelining, Example of a pipelined CISC & RISC processor.
V	Instruction level parallelism: VLIW Processors, Vector processors, Multithreaded processors, Extracting parallelism. Caches: Data Caches, instruction caches, Unified caches. Cache implementations, multilevel caches. Virtual memory : Organization, Mapping functions for translating the program pages in virtual to physical address space, Cache and virtual memory.

Required Text(s):

- Computer Architecture: Scahaum's outlines by Nicholas Carter Adapted by Dr. Rajkamal, 1st Edition, McGraw Hill, 2001.
- Computer Organization by Hamecher.
- William stallings ,Computer Organization & Architecture, 6th Edition, Prentice Hall, 2002.
- Computer Architecture & Parallel Processing, Hwang & Briggs, McGraw Hill.



M.Sc. (CS) III -Semester
CS 34-A: Software Engineering
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

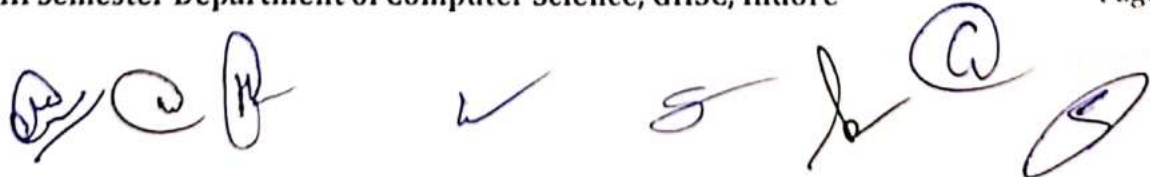
1. Understand the importance of the stages in the software life cycle.
2. Understand the various process models.
3. Be able to design software by applying the software engineering principles.
4. To understand important concepts of software engineering and project management.
5. Introduction of management information system.

Unit	Topic
I	Introduction to Software Engineering & Software Processes: Software problem, Software engineering problem, Software engineering approach, Software characteristics and Applications. Software processes and its components, characteristics of software processes, Software development processes: Linear Sequential model, Prototyping model, RAD model, Iterative Enhancement model, Spiral model, Component based development, Comparative study of various development models.
II	Project management process & Project Planning: The people, product, process and project, Phases of project management process, Project life cycle, the W5HH principle. Software configuration management process, Process management process: Capability Maturity Model (CMM). Project estimation (Size & Cost), Project Scheduling, Staffing and personnel planning, Software configuration management plans, Quality assurance plans, Project monitoring plans, Risk management.
III	Software Requirement Analysis and Specification : Software requirements, Problem analysis (Structured analysis and Object Oriented analysis), Requirements specifications, Validation and Verification.
IV	Software Design: Design principles: Problem partitioning and hierarchy, Abstraction, Modularity, Top-down and Bottom-up strategies. Effective Modular design: functional independency, Cohesion, Coupling. Structured design methodology. Software Quality Assurance: Quality concept, Quality management system, movements and assurance, Software reviews: formal and technical, Formal approaches to SQA, Statistical software quality assurance, Software reliability, ISO 9000, SQA plan.
V	Software Testing: Software testing techniques: Testing fundamentals, White box testing, Black box testing, Testing for specialized environments, architectures and applications. Software testing strategies: A strategic approach to software testing, Strategic issues, Unit testing, Integration testing, Validation testing and system testing, The art of debugging.

Required Text(s):

- Pankaj Jalote, An Integrated Approach to Software Engineering , Narosa Publishing House.
- R. S. Pressman ,Software Engineering-A practitioner's approach, 6th Edition Tata McGraw-Hill International Editions, New York,2004.

- Ian Sommerville , Software Engineering, 8th edition, Pearson Education, New Delhi,
- Richard E. Fairly, Software Engineering Concepts, Tata McGraw Hill Inc. New York.5.
- W. S. Jawadekar ,Software Engineering: Principle & Practice, Tata McGraw-Hill, New York.
- Rajib Mall ,Fundamentals of Software Engineering, PHI, New Delhi

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M.Sc. (CS) III -Semester
CS 34-B: Linux/ UNIX Administration
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75


Course Outcomes:

1. Learn UNIX structure, commands, and utilities.
2. Describe and understand the UNIX file system.
3. Write shell scripts in order to perform shell programming.
4. Acquire knowledge about text processing utilities, process management and system operation of UNIX.
5. Installation of software's and hardware's on Unix operating system.

Unit	Topic
I	Background: Evolution of Unix OS. Unix implementations. Features of Unix operating system. Linux operating system: Development of Linux. Applications of Linux operating system.
II	Basic UNIX environment: Basic commands, directory management, pipes, tee, I/O redirection and other utilities. Advanced commands: File system and process management commands, Shell, Pattern matching, Navigating the File Systems.
III	Unix editor: VI editor, Creating new files. Text addition, deletion and changes. Dealing with sentences and paragraphs. Searching. Cut, paste and copy. Running C/C++ programs. Shell programming: Features of shell. Shell variables. Control statements. Advance shell programming: Command line arguments. Interactive shell scripts. Debugging of shell scripts. Communication facilities in UNIX.
IV	Structure of unix operating system: Structure of unix kernel, Unix system calls. Unix system: File system calls, Process management calls. Advance Filter: Awk: Number processing, Interface with shell, functions.
V	Unix system administration: Adding and removing users. User accounting. Adding and removing hardware. Performing backups and restore. Disk space management. Unix system administration: Configuring the kernel. Network management in UNIX. Performance analysis. UNIX Desktop.

Required Text(s) :

- UNIX Operating Systems: Sumitabh Das, Tata McGraw Hills publication.
- UNIX System Administration Handbook(Second edition): Evi Nemeth, Garth Synder, Scott Seebass, Trent R Hein, Pearson Education - Asia, 2000.
- C: Design of UNIX Operating System: Maurice J. Back, Pearson Education – Asia



Open Elective Paper: Computer Application (Inter-disciplinary)

Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

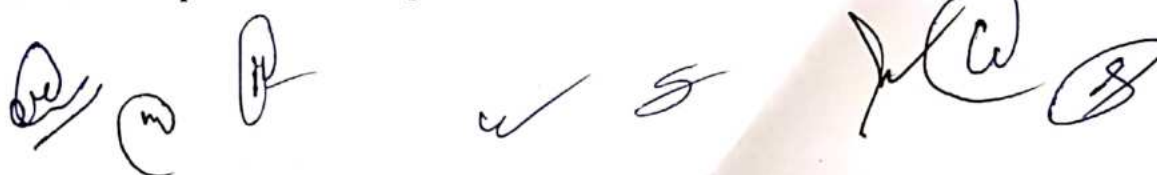
Course Outcomes:

1. Gain a comprehensive understanding of computer generations, Von Neumann machine architecture, and the components of computer organization.
2. Develop proficiency in using MS-Windows for effective navigation, file management, and system customization.
3. Master documentation skills in MS-Word, including document creation, formatting, advanced features, and file management.
4. Excel in electronic spreadsheet tasks using MS-Excel, from basic operations to advanced data analysis and visualization.
5. Acquire presentation skills with MS-PowerPoint, covering slide creation, enhancement, animation, and multimedia integration for effective communication.

Unit	Topic
I	Computer Generations Von Neumann Machine Architecture, Functional Units and Components in Computer Organization. Computers – Block diagram, Basic components of a Digital Computer - Control unit, ALU, Memory, Uses of Program Development, Tool, Editor, Compiler, Assembler, Interpreter, Algorithm, Flowchart, Logic Development & Problem solving.
II	MS-Windows: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel – display properties, adding and removing software and hardware, setting date and time, screen saver and appearance. Using windows accessories.
III	Documentation Using MS-Word - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Advance Features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.
IV	Electronic Spread Sheet using MS-Excel - Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation.
V	Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect.

TEXT AND REFERENCE BOOK

1. Rashid Sheikh, "Computer Organization & Architecture" (*Only for First Unit*)
2. Learn Microsoft Office – Russell A. Shultz – BPB Publication
3. Microsoft Office – Complete Reference – BPB Publication
4. Courter, G Marquis (1999). Microsoft Office 2000: Professional Edition. BPB.
5. PC Software – Shree Sai Prakashan, Meerut

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