

**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

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. IV Sem.

S.No	Paper	Course Title	Course Code	Credits	CCE (Max)	CCE (Min.)	External Assessment Max.	External Assessment Min.	Total Max.	Total Min.
1	Core 11	System Analysis And Design	CS41	4	25	9	75	26	100	35
2	Core 12	Design and Analysis of Algorithms	CS42	4	25	9	75	26	100	35
3	Elective 3/1	Internets and Web Technology	CS43 – A	4	25	9	75	26	100	35
	Elective 3/2	Computer Graphics & Multimedia	CS43 – B							
4	Elective 4/1	Compiler Design	CS44-A	4	25	9	75	26	100	35
	Elective 4/2	Python for Data Science	CS 44-B							
5	Practical 7	Practical based on Theory paper 11 & 12		3			75		75	26
5	Practical 8	Practical based on Theory Paper 3 & 4 (Elective)		3			75		75	26
6	Internship			4	50	18	50	17	100	35
				26	150		500		650	/

Dr. Pradeep Sharma
HEAD

Department of Computer Science
Govt. Holkar Science College
INDORE (M. P.)

27/02/25
JAN

M.Sc. (CS) IV -Semester
CS 41: System Analysis and Design
 Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

1. A firm basis for understanding the life cycle of a systems development project.
2. An understanding of the analysis and development techniques required as a team member of a medium-scale information systems development project.
3. An understanding of the ways in which an analyst's interaction with system sponsors and users play a part in information systems development.
4. Experience in developing information systems models.
5. Experience in developing systems project documentation.

Unit	Topic
I	System Concept: Definition, Characteristics, Elements of system, Physical and abstract system, open and closed system, man-made information systems. System Development Life Cycle: Various phases of system development, Considerations for system planning and control for system success. System Planning: Base for planning a system, Dimensions of Planning.
II	Initial Investigation: Determining users requirements and analysis, fact finding process and techniques. Feasibility study: Determination of feasibility study, Technical, Operational & Economic Feasibilities, System performance constraints, and identification of system objectives, feasibility report. Cost/Benefit Analysis: Data analysis, cost and benefit analysis of a new system. Categories determination and system proposal.
III	Tools of structured Analysis: Logical and Physical models, context, diagram, data dictionary, data diagram, form driven methodology, IPO and HIPO charts, Gantt charts, system model, pseudo codes, Flow charts- system flow chart, run flow charts etc., decision tree, decision tables, data validation, Input/ Output and Form Design: Input and output form design methodologies, menu, screen design, layout consideration.
IV	Management standards – Systems analysis standards, Programming standards, Operating standards. Documentation standards – User Manual, system development manual, programming manual, programming specifications, operator manual. System testing & quality: System testing and quality assurance, steps in system implementation and software maintenance. System security: Data Security, Disaster/ recovery and ethics in system development, threat and risk analysis. System audit.
V	Organization of EDP: Introduction. Job Responsibilities & duties of EDP Personnels- EDP manager, System Analyst, Programmers, Operators etc. Essential features in EDP Organization. Selection of Data Processing Resources: purchase, lease, rent-advantages and disadvantages. Hardware and software procurement – In-house purchase v/s hiring and lease.

Text & Reference Books:

- System Analysis & Design by V K Jain, Dreamtech Press
- Modern System Analysis & Design by A Hoffer, F George, Dr. Valaciah, Low Priced Edn. Pearson Education.

Guru
Dr. Pradeep Sharma
 HEAD
 Department of Computer Science
 Govt. Holkar Science College
 INDORE (M. P.)
 27/02/25
Jain

M.Sc. (CS) IV -Semester
CS 42: Designs and Analysis of Algorithms
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

1. Analyze the asymptotic performance of algorithms.
2. Demonstrate a familiarity with major algorithms and data structures.
3. Write rigorous correctness proofs for algorithms.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

Unit	Topic
I	Order Analysis: Objectives of time analysis of Algorithms. Big – oh, Omega and Theta notations. Master Theorem and its proof, Solutions of divides and conquers recurrence relations. Searching, Sorting, and Divide and Conquer Strategy: Linear Search, binary Search, Searching, Sorting and Divide and Conquer Strategy: Merge-Sort; Quick-Sort with average case analysis. Heaps and heap-sort. Lower bound on comparison- based sorting and counting sort.
II	Dynamic Programming: Methodology and examples (Fibonacci number, 0/1 Knapsack problem and some other simple examples) Dynamic Programming: Matrix Chain Multiplication, Weighted interval scheduling, Assembly Line Scheduling.
III	Greedy Method: Methodology, Examples and comparison with DP (more examples to come later in Graph Algorithms), task scheduling, Fractional Knapsack problem and some other simple examples.
IV	Graph Algorithms: Basics of graphs and their representations. BFS, DFS, Topological Sorting. Minimum Spanning trees (Kruskal and Prim's Algorithms, brief discussions of disjoint set and Fibonacci heap data structure), Shortest Paths (Dijkstra, Bellman- Ford, Floyd-Warshall).
V	Hard Problems and Approximation Algorithms: Problem classes P, NP, NP-hard and NP-complete, deterministic and nondeterministic Polynomial- time algorithms. Approximation algorithms for some NP-complete problems.

Required Text(s):

- A.V. Aho, J.E. Hopcroft, and J. D. Ullman, *The Design and Analysis of Computer Algorithms*, HEAD Addison Wesley.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to algorithms*, MIT Press: 2nd Edition (1st September, 2001).
- E. Horowitz and Sahni, *Fundamentals of Computer Algorithms*, Galgotia Publications.

Or Predepr. Syllabus
HEAD

*Department of Computer Science
 Govt. Holkar Science College
 INDORE (M. P.)*


 Singh
 27/02/25
 [Signature]

M.Sc. (CS) IV -Semester
CS 43-A: Internet and Web Technology
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Style Sheets.
3. Build dynamic web pages using JavaScript (Client-side programming).
4. Analyze to Use appropriate client-side or Server-side applications.
5. Build interactive web applications using CRUD.

Unit	Topic
I	Introduction Dynamic Web Programming, HTML Forms, scripting languages, Introduction to HTTP, web Server and application Servers, Installation of Application servers, Configuration files, Web.xml. Java Servlet, Servlet Development Process, Deployment Descriptors, The Generic Servlet Lifecycle.
II	Servlet Packages, Classes, Interfaces, and Methods, Handling Forms with Servlets. Various methods of Session Handling. Various elements of deployment descriptors. Java Database Connectivity: various steps in process of connection to the database, Various type of JDBC Driver.
III	Connection of JSP and Servlet with different database viz. Oracle, MS-SQL Server, MySQL. java.sql Package. Accessing metadata from the database. Type of Statement, Connection pooling: multiple users and need of connection pooling.
IV	JSP Basics: JSP lifecycle, Directives, scripting elements, standard actions, implicit objects. Writing JSPs. Expression Language (EL), Separating Business Logic and Presentation Logic, Building and using JavaBean.
V	Session handling in JSP, Types of errors and exceptions handling, Standard Tag Library in JSP, Building Custom Tag Library, JSP Tag Library, MVC Design pattern Advances in J2EE and Other Web technology.

Required Text(s):

- Kevin Mukhar, Chris Zelenak, James L Weaver, "Beginning Java EE 5: From Novice to Professional" Apress
- Marty Hall, Larry Brown, "Core Servlets and Java Server Pages", 2nd edition, Pearson
- Education
- JavaDoc for various technologies
- Internet and Web technologies, TMH, 2002

Dr. Pradeep Sharma

Department of Computer Science
Govt. Holkar Science College
MORE (M. B.)

10/02/25

M.Sc. (CS) IV -Semester
CS 43-B: Computer Graphics and Multimedia
Academic Year 2024-2025

Min. Marks: 26

Max. Marks: 75

Course Outcomes:

1. Students will demonstrate an understanding of contemporary graphics hardware.
2. Students will create interactive graphics applications in C++ using one or more graphics.
3. Students will create interactive graphics applications in C++ using one or more graphics application programming interfaces.
4. Students will write program functions to implement graphics primitives.
5. Students will write programs that demonstrate geometrical transformations.

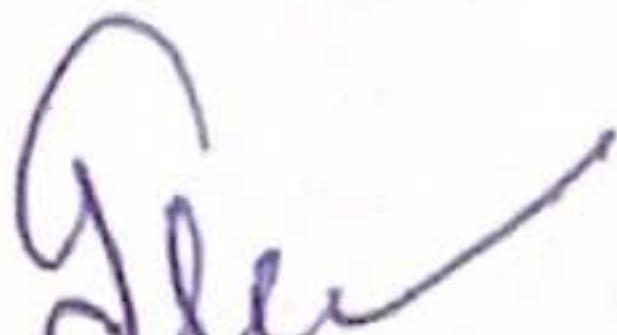
Unit	Topic
I	<p>Introduction: Application of Graphics, Display Devices: Refresh Cathode -Ray Tubes, Raster Scan Displays, Random Scan Displays, Color CRT Monitors, Flat Panel Displays. Video cards/display cards.</p> <p>Input Devices: Mouse, Trackball, Space ball, Data Glove, Joystick, Light pen, Scanner, Digital Camera, Touch Panels, Voice Systems.</p> <p>Hardcopy Devices: Printers and Plotters.</p>
II	<p>Graphics Primitives:</p> <p>Line Generation Algorithms: DDA algorithm, Bresenham's algorithm.</p> <p>Circle Generation Algorithms: Midpoint Circle algorithm, Bresenham's circle generation algorithm.</p> <p>Displaying: Lines, characters and polygon.</p> <p>Polygon filling Algorithms: Scan Line Polygon fill algorithm, Inside - Outside Tests, Boundary-Fill algorithm, Flood -Fill algorithm. Fundamentals of aliasing and Antialiasing Technique.</p>
III	<p>Clipping: Clipping operations, Point clipping.,</p> <p>Line clipping: Cohen Sutherland Algorithm, Liang Barsky Algorithm, Nicholl-Lee-Nicholl Algorithm.</p> <p>Polygon clipping: Sutherland- Hodgeman Algorithm, Weiler Atherton Algorithm., Text clipping, Exterior clipping.</p>
IV	<p>Two Dimensional & Three Dimensional</p> <p>Two Dimensional Transformations: Translation, Scaling, Rotation, Reflection, Shear, Homogenous coordinate system, composite transformations, raster method of transformation.</p> <p>Two Dimensional Viewing: Window to View port coordinate transformation.</p> <p>Three Dimensional: 3D Geometry, 3D display techniques, transformations. Projections: Parallel Projection, Perspective Projection.</p>
V	<p>Shading and Color Application:</p> <p>Visible surface Detection Methods: Depth Buffer Method, A-Buffer Method.</p> <p>Illumination Model: Diffuse & Specular reflection, Point Source, Ambient Light,</p>



Transparency, Surface Pattern & texture, shadow, Halftoning, Dithering Techniques, Color Models.

Required Text(s)

- Donald Hearn and M. Pauline Baker, Computer Graphics , Second Edition, Tata McGraw Hill,1997.
 - Donald Hearn and M. Pauline Baker, Computer Graphics : C version , Second Edition, Tata McGraw Hill,1996.
 - William M. Newman, Principals of Interactive Computer Graphics, Second Edition, Tata McGraw Hill,1978.
 - David F. Rogers,Tata Procedural Elements for Computer Graphics, Mc-Graw-Hill Edn,New Delhi, 2000.


Mr. Pradeep Sharma

**Department of Computer Science
Govt. Hotakar Science College
INDORE (M.P.)**

唐
2702125

III. ID
Department of Computer Science
Govt. Holland Science College
INDORE (M.P.)

27/02/25

Course Outcomes:

- Understand the major phases of compilation and to understand the knowledge of Lex tool.
- Develop the parsers and experiment the knowledge of different parsers design without automated tools.
- Construct the intermediate code representations and generation.
- Convert source code for a novel language into machine code for a novel computer.
- Apply for various optimization techniques for dataflow analysis.

Unit	Topic
I	Translators, interpreters, assemblers, Compilers, Model of a compiler. Analysis of source program, The phases of a compiler, Cousins of the compilers. Finite automata, non-deterministic and deterministic finite automata, Acceptance of strings by NDFA and DFA, Transforming NDFA to DFA. Minimization/Optimization of a DFA, related algorithm, Regular sets and regular expression. Obtaining regular expression from finite automata. Lexical analyzer design, the role of Lexical Analyzer, Input Buffering, Specification of tokens, and Recognition of tokens. Syntax analysis, CFG, derivation of a parse tree, reduction of grammar, useless grammar symbols, Elimination of null and unit Productions. Elimination of left recursion Regular grammar, Right linear and left linear grammar.
II	Parsing: Top-Down and Bottom Up parsing, general parsing strategies. Brute-force approach, recursive descent parser and algorithms. Simple LL (1) grammar, LL (1) with null and without null rules grammars, Bottom-up parsing- Handle of a right sentential Form, Shift-reduce parsers, operator precedence parsing, LR, SLR, canonical LR and LALR grammar and parsers.
III	Symbol table contents, organization for non-block structured language-unordered, ordered, and tree-structured and hash, Organization for block structured languages-stack symbol tables. Stack-implemented tree structured stack implemented hash structured symbol tables.
IV	Specification of translations, implementation of translation specified by syntax-directed definition, L-attributed definitions, and syntax-directed translation schemes Intermediates code generation, representing three-address statement, translation schemes for programming language constructs.
V	Code Optimization:- Definition, loop Optimization, Elimination of local and global common sub Expressions, loop unrolling, Loop Jamming. Code Generation:- Definition, machine model, code generation methods, Peephole optimization. Error Handling :- Error recovery from various phase and parsing

Dr. Pradeep Sharma
 HEAD
 Department of Computer Science
 Govt. Holkar Science College
 INDORE (M. P.)

27/02/25

Sarkar

✓

D.

Jaw

D Required Text(s)

- Alfred V. Aho, Monica S. Lam Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques, and Tools, 2nd Edition, Addison Wesley: 2006.
 - Alfred V. Aho, Jeffrey D. Ullman, Principles of Compiler Design, Addison Wesley: 1977
 - Jean Paul Tremblay, Paul G. Sorenson, The Theory & Practice of Compiler Writing, Tata McGraw Hill, May 1985.
 - William A. Barrett, John D. Couch, Compiler Construction Theory & Practice, Sra, June 1979.

See

Dr. Pradeep Sharma

HEAD

Department of Computer Science

Govt. Holkar Science College

INDORE (M.P.)

Dr. Pradeep Sharma
HEAD
Department of Computer Sciences
Govt. Holkar Science College
INDORE (M.P.)

Tree & B

Cards

over

3

or

at

n

27/02/25

Sark

3

2

1

for

Course Outcomes:

1. Understand the history and significance of Python programming, including its diverse application areas.
2. Demonstrate the ability to install Python IDE (PyCharm), execute Python code from the command line, and utilize the IDE effectively.
3. Master Python basics, including keywords, data types, variables, type conversion, expressions, operators, and input/output operations.
4. Apply control statements in Python, including if statements, loops (for and while), and relevant control flow constructs.
5. Gain proficiency in handling sequences such as arrays, strings, lists, tuples, sets, and dictionaries, and learn about functions, modules, and object-oriented programming in Python.

Unit	Topic
I	Introduction: History of Python, Need of Python Programming, The application area of python, Installation of Python IDE(PyCharm), Execute form command line and using IDE. Python Basics: Keyword, Data Types &Variables, Type conversion in Python, Expression, Operator, Data input and output. Control Statement in Python: if statement, if-elif-else statement, for loop, while loop, break, continue, pass, else clause. Sequences in Python: Array, String, list, Tuple, Set, Dictionary.
II	Function: Define Function, main() in python, Calling function, Passing Argument, Keyword Arguments, Default Arguments, Variable length Argument, Anonymous Functions, Fruitful function(Function Returning Values), Scope of Variable in Function, Recursion, Decorator. Module: Definition, Importing module using import statement, from statement, Creating Module, namespacing, Python Packages, Introduction to PIP, installing package by a PIP.
III	Object- Oriented Programming in Python: Class & Object, Methods, Constructor and Destructor, Inheritance, Overriding, Overloading, Data Hiding, Error and Exception Handling.
IV	Introduction: What is Data Science, Data Science Process, Application of Data Science, Types of Data: Quantitative and Qualitative. Graphical Reorientation of Data: Pie Chart, Bar Graph, Line Chart, Pareto Chart, Histogram, Scatter. Measuring the Centre of Quantitative Data: Mean, Median, Mode. Measuring the Variability of Quantitative Data: Range, Standard Deviation, and Variance. Introduction to Data Cleansing, Missing and Repeated Values, Feature Engineering, Outliers and Errors, Finding Outliers, Cleaning Data.
V	File Handling in Python: Read, Create/Write, Delete, and Rename, Reading and Writing CSV Files in Python. Data Analysis with Python: NumPy, SciPy, Pandas, Matplotlib. Interface Python with SQL, Introduction to MongoDB.

Dr. Pradeep Sharma
HEAD
Department of Computer Sciences
Govt. Holkar Science College
INDORE (M. P.)

27/02/25
Dr. Pradeep Sharma

Required text (s):

1. Paul Barry, "Head First Python: A Brain-Friendly Guide", 2nd Edition, O'Reilly Media.
2. Eric Matthes, "Python Crash Course", 2nd Edition, No Starch Press
3. Mark Lutz, "Learning Python", 5th Edition, O'Reilly Media.
4. Wes McKinney, "Python For Data Analysis: Data Wrangling With Pandas, NumPy, And IPython", 2nd Edition, O'Reilly Media.

Dr.

Dr. Pradeep Sharma

HEAD

Department of Computer Science

Dost Holkar Science College

INDORE (M. P.)

27/02/25

Sark

3

or

2

Prashant

2

2

✓ ✓ ✓

✓ ✓ ✓

Jaw

G G G K ✓
Rajesh ✓
Carab ✓

Note :-

1. Where field visit is involved, it will be in lieu of one seminar and will be given 25 marks.
2. Where Academic tour (of one week at least) is involved, it will be in lieu of two seminar and will be given 50 marks. Deptt. will arrange tour either in 1st Sem or in 2nd Sem.
4. Minimum passing marks will be 40% each Theory, Practical, CCE, Internship/Project)
5. Grades and Grade points will be as follows:

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)	Less than 4
Ab (Absent)	0

Mr. Prajapati Sharma

HEAD

Department of Computer Science
Govt. Holkar Science College
INDORE (M.P.)

27/02/25
Jan