SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year	**IV/II**	**Program**	**B.Tech – Artificial Intelligence and Data Science**

Subject Category	**DC**	**Subject Code:**	**AI 401**	**Subject Name**	**Computer Network**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**	**30**	**10**	**10**	**150**	**3**	**0**	**2**	**4**

Prerequisites:

Student having fundamental knowledge of analog and digital communication.

Course Objective:

- Have fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in the area.
- Be familiar with various types of computer networks.
- Understand the concepts of Network Layer ,Transport Layer, Application Layer

UNITs	**Descriptions**	**Hrs.**
I	Computer Network: Definitions, goals, components, structure, Architecture, Classifications & types, Growth, Complexity and applications etc. Layered Architecture: Protocol hierarchy, Connection Oriented & Connectionless Services, Service primitive Design issues & its functionality. ISO-OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Network standardization	8
II	Transmission Media, Sources of transmission impairment. Network Topology: Mesh, Bus, Star, Ring, Tree, etc. Standards Connecting Devices: Active and Passive Hubs, Repeaters, Bridges, Two- & Three-layer switches & Gateway.	8
III	Data Link Layer: Need, Services Provided, Framing & its methods, Flow Control, Error control. DLL Protocol: Elementary & Sliding Window. Piggybacking & Pipelining. MAC Sub layer: Static & Dynamic channel allocation, Media access control for LAN & WAN. Collision free & limited contention protocol ALOHA : pure, slotted CSMA, CSMA/CD,CSMA/CA, IEEE 802 standards for LAN & MAN & their comparison.	8
IV	Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing Strategies, Congestion Control Algorithms: General Principles of Congestion control, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram subnets. Comparison of IPv4 & IPv6, Mobile IP.	8
V	Processes to Processes Delivery: Transmission Control Protocol (TCP) – User Datagram Protocol, Data Traffic, Congestion Control and Quality of Service, Techniques to improve QOS, Integrated Services, and Differentiated Services, DNS,SMTP, FTP, HTTP, WWW, Virtual Terminal Protocol, VoIP: Basic IP Telephone System.	8
Total Hours		40

Course Outcomes:

CO1: Develop a fundamental understanding of network design principles and structure of computer network.
CO2: Explain the importance of data communications, how communication works in data networks and the internet, recognize the different internetworking devices and their functions.
CO3: Explain the role of protocols in networking, Analyze the role and services and features of the various layers of data networks.
CO4: Analyze the features and operations of various routing protocols such as Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing.
CO5: Describe and examine working of Transport Layer and Application Layer protocol.

Text Book

1. Tanenbaum A. S, “Computer Networks”, Pearson Education , 4th Edition
2. William Stallings, “Data and Computer Communications”, PHI 6th Edition .

Reference Books-

1. Douglas E. Comer ,”Computer Network & Internet”, Pearson Education, 6th Edition.
2. Behraj A Forouzan,”Data Communication & Networking”, McGraw-Hill,4th edition.
3. Natalia Olifar & Victor Olifer,”Computer Networks”, Willey Pub.
4. Prakash C. Gupta, “Data Communications and Computer Networks”, PHI,2end edition.

5. Gallo,"Computer Communication & Networking Technologies", Cengage Learning.1st edition.

List/Links of e-learning resource

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	2											3	
CO-2	3	3			1								2	
CO-3	3	3	1		1							3		3
CO-4	3	3	2	1								1		3
CO-5	3	3										1	2	

Suggestive list of experiments:

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool. CO1
2. Study of Network Devices in detail. CO2
3. Demonstrate single parity bit for error detection. CO3
4. To understand error detection and correction technique Implement hamming code. CO3
5. To understand error detection technique, Implement CRC. CO3
6. To understand working of framing method Implement bit stuffing with start and end flag. CO5
7. To understand farming methods, implement character count farming method. CO5
8. To study and understand network IP. CO4
9. Connect the computer in local Area Network. CO1

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	IV/II	Program	B.Tech – Artificial Intelligence and Data Science

Subject Category	DC	Subject Code:	AI 402	Subject Name	Database Management System

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Basic Knowledge of Mathematics and Programming

Course Objective:

- To understand the different issues involved in the design and implementation of a database system.
- To represent a database system using ER diagrams and to learn normalization techniques
- To learn the fundamentals of data models, relational algebra, and SQL.
- To understand the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques

UNITs	Descriptions	Hrs.
I	Introduction: Purpose of Database System –– Views of data – data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes relationships, relationship types, E/R diagram notation, examples.	6
II	Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses.	8
III	Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF.	9
IV	Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.	9
V	Implementation Techniques: Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.	8
Total Hours		40

Course Outcomes:

CO-1: Understand the basic concepts, principles and applications of database systems.
CO-2: Discuss the components of DBMS, data models, Relational models.
CO-3: Use knowledge to find the functional dependencies and differentiate between different normal forms.
CO-4: Execute transaction concepts and concurrency protocols
CO-5: Articulate the basic concept of storage and access techniques.

Text Book

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems , Pearson Education
2. Silberschatz, Korth, "Data base System Concepts", 7th ed., McGraw hill.

Reference Books-

1. C. J. Date, "An Introduction to Database Systems", 8th ed., Pearson.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems McGraw Hill.
3. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management ,Cengage Learning.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106/104/106104135/
- https://nptel.ac.in/courses/106/106/106106220

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**										**1**	**2**
CO-2	**3**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**		**2**								**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**2**	**2**											**1**

Suggestive list of experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database CO1
2. Apply the constraints like Primary Key , Foreign key, NOT NULL to the tables CO2
3. Write a sql statement for implementing ALTER,UPDATE and DELETE CO2
4. Write the queries to implement the joins CO2
5. Write the query for implementing the aggregate functions CO1
6. Write the query to implement the concept of Integrity constraints CO2
7. Write the query to create the views CO1
8. Perform the queries with group by and having clauses CO3
9. Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints CO4
10. Write the query for creating the users and their role CO5

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		IV/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI-403	Subject Name		Foundation of Data Science				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Mathematics

Course Objective:

· To provide the knowledge and expertise to become a proficient data scientist;

· Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;

· Produce Python code to statistically analyze a dataset;

· Critically evaluate data visualizations based on their design and use for communicating stories from data;

UNITs	Descriptions	Hrs.
I	Data Science-What is Data Science, Need for Data Science, Difference between Data Science & Business Intelligence, Data Science Components, Tools for Data Science, Data Science Life cycle, Applications of Data Science, Data Science Ethics. Representation of Data- Types of data, primary, secondary, quantitative and qualitative data. Types of Measurements, nominal, ordinal, discrete and continuous data.	8
II	Presentation of data by tables, construction of frequency distributions for discrete and continuous data. Graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions. Data Pre-processing- Knowing Data, Data Cleaning, Data Integration, Data Selection, Data Transformation	8
III	Descriptive Statistics-Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis	8
IV	Correlation-Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations. Regression: Concept of errors, Principles of Least Square, Simple linear regression and its properties. Types of Regressions.	8
V	Basics of Big Data, Problem handling large data, general techniques for handling large data, Basic concept of Machine Learning, training model, validating model, supervised & unsupervised learning.	8
Total Hours		40

Course Outcomes:

CO1: To explain how data is collected, managed and stored for data science.
CO2: To understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
CO3: To implement data collection and management scripts using Mongo DB.
CO4: Examine the techniques of Data Visualization.

CO5: Identification of various applications of Data Science.

Text Books

1. "Introducing Data Science" by Davy Cielen, Arno D. B. Meysman, Mohamed Ali, 1st Edition, Manning Publications Co.
2. "An Introduction to Probability and Statistics" by Rohatgi V.K and Saleh E, 3rd Edition, John Wiley & Sons Inc., New Jersey,
3. "Data Mining Concept & Techniques" by Han & Kember,3rd Edition, The Morgan Kaufmann,

Reference Books

1. Joel Grus, Data Science from Scratch, Shroff Publisher/O'Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Num sense Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly Publisher.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106179

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

Cos	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	3		2									**1**	**2**
CO-2	2	2											**2**	**2**
CO-3	2	1	3										**1**	**2**
CO-4	1	2											3	1
CO-5	3	3		2									2	3

Suggestive list of experiments:

1. Working with various types of data CO1/CO2
2. Experiment on measurement of data CO3
3. Experiments on presentation of Data CO4
4. Develop program for Frequency distributions CO4
5. Develop program for Variability CO4
6. Develop program for Averages CO4
7. Develop program for Normal Curves CO4
8. Develop program for Correlation and scatter plots CO4
9. Develop program for Correlation coefficient CO4
10. Develop program for Simple Linear Regression CO5

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		IV/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	DC	Subject Code:	AI 404	Subject Name	Software Engineering

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	0	0	3

Prerequisites:

Fundamental knowledge of system, analysis and design

Course Objective:

- To introduce students to the basic concepts, testing techniques and applications of Software Engineering.
- To provide a brief, hands-on overview of software development life cycle.
- Develop and write a software project proposal.
- Develop and write a Software Requirements Specification.
- To understand and apply the various phases of software development like information gathering, feasibility, Process model, analysis, design, Estimations, quality, risk, maintenance, reengineering.

UNITs	Descriptions	Hrs.
I	Introduction to Software and Software Engineering The Evolving Role of Software, Software: Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Incremental Model, Spiral, Evolutionary Process Models, Agile Process Model, Component-Based Development, the capability maturity model integration (CMMI) , ISO 9000 Models.	8
II	Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. System models: Context models, behavioral models, data models, object models, structured methods.	6
III	Software Project Planning, Design Methodologies and Software Metrics, Software Project Planning: Project planning objectives, Decomposition Techniques, Empirical estimation models, Software Project Estimation Models, CPM/PERT. Design concept: Design Principles, Abstractions, refinement modularity, effective modular design, Cohesion & Coupling, Design notation, and specification, structure design methodologies, & design methods. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	9
IV	Software Testing, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	9
V	Software Maintenance and Software Reengineering, Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Adaptive,Corrective and Perfective Maintenance, Cost of Maintenance, Software Reengineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools, Risk management: Reactive vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM plan.	8
Total Hours		40

Course Outcomes:

CO-1: Interpret and justify different software development life cycle models.
CO-2: Understand the requirement analysis and identify state & behavior of real world software projects.
CO-3: Use various design methodologies to derive solutions for software project.
CO-4: Evaluate and quantify the quality of software though evaluation metrics.

CO-5: Identify and analyse the risk in development. CO-5: Evaluate different testing methods for software project management.

Text Book

1. Roger S. Pressman, "Soflware Engineering — A Practitioner's Approach", Seventh Edition, McGraw-Hill International Edition,2010.
2. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited,2009.
3. Srinivasan Desikan and Gopalaswamy : Software Testing, Principle.

Reference Books

1. Elis Awad, "System Analysis & Design", Galgotia publications.
2. Pankaj Jalote "Software Engg" Narosa Publications.
3. Ian Sommerville: Software Engineering 6/e (Addison-Wesley).
4. Richard Fairley: Software Engineering Concepts (TMH).
5. Hans Vans Vilet, "Software Engineering Principles and Practice", Wiley.

List/Links of e-learning resource

https://onlinecourses.nptel.ac.in/noc23_cs122/preview

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	3	1	1								2	3	1
CO-2	3	2	3	2								3	2	
CO-3	3	2	1	3	2							2	2	2
CO-4	2	3	2	2			3						2	2
CO-5	2	2	1									3	1	2

Suggestive list of design methodology tools:

1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements). For a set of about 10 sample problems .
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem.
3. Develop UML Use case model for a sample problem .
4. Develop Sequence Diagrams.
5. Develop Class diagrams.
6. Use testing tool such as junit
7. To compute cyclometic complexity for any flow graph.
8. Using configuration management tool-libra.
9. Use CPM/PERT for scheduling the assigned project.
10. Use Gantt Charts to track progress of the assigned project.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year	III/II	Program	B.Tech – Artificial Intelligence and Data Science
Subject Category: DC	Subject Code: AI 405	Subject Name	Analysis and Design of Algorithms

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

Prerequisites:

- **Data Structure**

Course Objective:

- Determine different time complexities of a given algorithm
- Demonstrate algorithms using various design techniques.
- Develop algorithms using various design techniques for a given problem.

UNITs	Descriptions	Hrs.
I	Algorithms: Definition and characteristics. Analysis: Space and Time Complexity, Asymptotic Notations, Time Complexity Analysis of algorithms (Linear Search, Insertion Sort etc.)Recursive algorithms and recurrence relations. Solutions of recurrence relations. Divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, quick sort, merge sort, Heap Sort, Strassen's matrix multiplication with their complexity analysis.	8
II	Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, optimal merge patterns, Huffman coding, Dynamic Programming: Multistage Graph, all pairs shortest paths, 0-1 Knapsack, Chained matrix multiplication, longest common subsequence, Travelling salesperson problem.	8
III	Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms- Dijkstra's Algorithms and Complexity Analysis, Transitive closure, Minimum Spanning Tree- Prim's and Kruskal's Algorithm and their complexity analysis, Union Find Data Structure, Topological sorting, Network Flow Algorithm.	8
IV	Branch & Bound technique: Definition and application to solve 0/1 Knapsack Problem, 8-puzzle problem, travelling salesman problem. Back tracking concept and its examples like 8 Queens's problem, Hamiltonian cycle, Graph Coloring problem.	8
V	Tractable and Intractable Problems: Computability of Algorithms- P, NP, NP-complete and NP-hard. Introduction to Approximation Algorithms, NP-complete problems and Reduction techniques. Lower bound theory and its use in solving algebraic problem.	8
Total Hours		40

Course Outcomes:

CO-1: Analyze and justify the running time complexity of algorithms
CO-2: Articulate the effectiveness of divide and conquer methods to solve searching, sorting and other problems.
CO-3: Understand the combinatorial problems and justify the use of Greedy and Dynamic Programming

techniques to solve them.
CO-4: Model graph or tree **f**or a given engineering problem, and write the corresponding algorithm to solve it.
CO-5: Able to analyses the NP-complete

Text Book

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI, 3rd edition.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press.

Reference Books-

Gilles Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106131/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. Implement Linear Search and Binary Search and compare their time complexities for a large dataset. CO1
2. Implement Insertion Sort and display the number of swaps and comparisons for a given input. CO1
3. Write a program to demonstrate Strassen's Matrix Multiplication for two 2x2 matrices. CO1
4. Implement Knapsack Problem using the greedy approach and display the items selected. CO2
5. Write a program for Huffman Coding to generate codes for given characters and their frequencies. CO2
6. Solve the Longest Common Subsequence Problem (LCS) using dynamic programming. CO2
7. Implement Depth First Search (DFS) and Breadth First Search (BFS) on a given graph. CO3
8. Write a program to find the Shortest Path using Dijkstra's Algorithm for a weighted graph. CO3
9. Implement Kruskal's Algorithm to find the Minimum Spanning Tree (MST) of a graph. CO3
10. Implement the N-Queens Problem using backtracking. CO4
11. Solve the 8-Puzzle Problem with backtracking and display steps. CO4
12. Write a program for the Traveling Salesman Problem (TSP) using brute force. CO4
13. Demonstrate a simple example of an NP-Complete Problem (like Subset Sum) with brute force. CO5
14. Write a program to solve a Graph Coloring Problem with a backtracking approach. CO5
15. Implement a basic example of Reduction to show the transformation of one problem to another. CO5

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		III/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	DL	Subject Code:	AI 406	Subject Name	Advance JAVA Programming

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
--	--	--	--	60	20	20	100	0	0	4	2

Prerequisites:

Concepts of OOPS and Core JAVA.

Course Objective:

- To introduce and understand students to programming concepts and techniques using the Java language and programming environment, class, objects , also learn about lifetime, scope and the initialization mechanism of variables and improve the general problem solving abilities in programming. Be able to use the Java SDK environment to create, debug and run simple Java program

UNITs	Descriptions	Hrs.
I	Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes.	7
II	Java Collective Frame Work - Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: sort, shuffle, reverse, fill, copy, max and min ,binary Search, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Unmodifiable Collections.	8
III	Advance Java Features - Multithreading: Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC.	7
IV	Advance Java Technologies - Servlet: Overview and Architecture, Handling HTTP & HTTPS, get Requests, JDBC, Using JDBC from a Servlet, Java Server Pages (JSP): First JSP Example, JSP elements, JSP tag library, Session tracking, , Java Cryptographic Architecture (JCA).	7
V	Advance Web/Internet Programming (Overview): Struts- Basics of MVC, architecture, action class, interceptors, tag library, validations, Hibernate-basics, architecture, CRUD, Spring- framework introduction.	7
Total Hours		36

Course Outcomes:

CO1: Use the syntax and semantics of java programming language and basic concepts of OOP.

CO2: Write basic Java applications and use arrays.

CO3: Develop reusable programs using the concepts of RMI and JDBC.

CO4: Apply the concepts of Servlet and JSP using advanced tools.

CO5: Design event driven GUI and web related applications which mimic the real word scenarios.

Text Book & Reference Books-

1. E. Balaguruswamy, “Programming In Java”; TMH Publications
2. The Complete Reference: Herbert Schildt, TMH
3. Deitel & Deitel,” JAVA, How to Program”; PHI, Pearson
4. Cay Horstmann, Big JAVA, Wiley India
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall
6.

List/Links of e-learning resource

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Internal assessment/Lab assignments, Quiz, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	2	1	2										1	1
CO-2	2	1	2										1	1
CO-3	2	1	2										1	2
CO-4	2	2	2										1	2
CO-5	2	2	2										1	2

Suggestive list of experiments:

1. Installation of JDK. CO1
2. Write a program to show Scope of Variables CO1
3. Write a program to show Concept of CLASS in JAVA CO1
4. Write a program to show Type Casting in JAVA CO1
5. Write a program to show How Exception Handling is in JAVA CO1
6. Write a Program to show Inheritance CO1
7. Write a program to show Polymorphism CO1
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA CO1
9. Write a program to show use and Advantages of CONSTRUCTOR CO1
10. Write a program to show Interfacing between two classes CO2
11. Write a program to Add a Class to a Package CO1
12. Write a program to show Life Cycle of a Thread CO1
13. Write a program to demonstrate AWT. CO5
14. Write a program to Hide a Class CO1
15. Write a Program to show Data Base Connectivity Using JAVA CO3
16. Write a Program to show "HELLO JAVA " in Explorer using Applet CO5
17. Write a Program to show Connectivity using JDBC CO3
18. Write a program to demonstrate multithreading using Java. CO1
19. Write a program to demonstrate applet life cycle. CO5
20. Write a program to demonstrate concept of servlet. CO4

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	IT