Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
('A+' Grade, NAAC Accredited)

|| योगस्थ: कुरु कर्माणि ||
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)

Syllabus of Examination (7th Semester) for Under-Graduate Programmes
Subject: Computer Science
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

<table>
<tr><td colspan="4">Session: 2025-26</td></tr>
<tr><td colspan="4">Part A - Introduction</td></tr>
<tr><td>Subject</td><td colspan="3">Computer Science</td></tr>
<tr><td>Semester</td><td colspan="3">VII</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Principles & Paradigms of Programming Languages</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CSE-701</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">CC-H1</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">400-499</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3"></td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Explain the fundamental concepts, design issues, and paradigms of programming languages.
2. Compare and contrast different programming paradigms such as imperative, object-oriented, functional, and logic-based.
3. Analyse syntax, semantics, and language features using formal methods and tools.
4. Apply programming paradigms to design and implement solutions for computational problems.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>4</td><td>0</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>4</td><td>0</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks: 70</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
<tr><td colspan="4"><u>Instructions for Paper-Setter</u>
The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions, selecting one from each unit. First</td></tr>
</table>

question will be compulsory.

Unit	Topics	Contact Hours
I	History and Evolution of Programming Languages, Programming Domains and Language Evaluation Criteria, Syntax and Semantics, Lexical and Syntax Analysis (Overview of Compilers), Names, Binding, Scope, Data Types: Primitive, Composite, Abstract Type Systems: Static vs Dynamic, Strong vs Weak Typing, Variable Lifetime and Storage Bindings	15
II	Control Structures and Data Abstraction, Expressions and Assignment Statements, Control Structures: Conditional Statements, Loops, Goto, Structured Programming, Subprograms: Functions, Procedures, Parameter Passing Mechanisms: Call by Value, Reference, etc., Recursion and Tail Recursion, Abstract Data Types and Encapsulation	15
III	Imperative Programming: C, Python, Object-Oriented Programming: Java, C++, Classes, Objects, Inheritance, Polymorphism, Functional Programming: Haskell, Scheme, or Lisp, First-Class Functions, Higher-Order Functions, Lambda Calculus, Logic Programming: Prolog, Facts, Rules, Queries, Backtracking	15
IV	Overview of Language Translation (Compilation vs Interpretation), Virtual Machines and Intermediate Representations, Memory Management: Stack vs Heap, Garbage Collection Exception Handling Mechanisms, Concurrency and Multithreading, Domain-Specific Languages (DSLs), Introduction to Modern Language Features (e.g., Rust, Kotlin, Swift)	15

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory**

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 5
- Mid-Term Exam: 20

End-Term Examination: A three-hour exam for theory of 70 marks.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Concepts of Programming Languages by Robert W. Sebesta
- Programming Language Pragmatics by Michael L. Scott
- Types and Programming Languages by Benjamin C. Pierce (Advanced)
- Language documentation: Python, Java, Haskell, Prolog, etc.

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<tr><td>Subject</td><td colspan="3">Computer Science</td></tr>
<tr><td>Semester</td><td colspan="3">VII</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Software Testing</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CSE-702</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">CC-H2</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">400-499</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3"></td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Explain fundamental concepts, principles, and objectives of software testing.
2. Apply various testing techniques (black-box, white-box, unit, integration, system, regression) to evaluate software quality.
3. Use testing tools and frameworks to design, execute, and automate test cases.
4. Analyse and evaluate test results to ensure reliability, performance, and correctness of software systems.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>4</td><td>0</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>4</td><td>0</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks: 70</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
<tr><td colspan="4"><u>Instructions for Paper-Setter</u>
The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions, selecting one from each unit. First</td></tr>
</table>

question will be compulsory.

Unit	Topics	Contact Hours
I	Introduction to Software Testing, Importance of testing, Errors, Faults, Failures, and Defects, Software Development Life Cycle (SDLC) & Testing Life Cycle (STLC), Types of Testing: Manual vs Automated, Static vs Dynamic, Functional vs Non-functional, Testing Levels: Unit, Integration, System, Acceptance Testing, Verification vs Validation, Test Planning and Documentation.	15
II	Test Design Techniques and Strategies, Black Box Testing Techniques: Equivalence Partitioning Boundary Value Analysis, Decision Table Testing, State Transition Testing, White Box Testing Techniques: Statement, Branch, Condition Coverage, Path Testing, Control Flow Graph, Integration Testing: Top-Down, Bottom-Up, Big Bang, System and Acceptance Testing Strategies, Regression Testing and Smoke Testing.	15
III	Automation Testing and Tools, Introduction to Test Automation, Benefits and Challenges, Selecting test cases for automation, Test Automation Frameworks, Introduction to Selenium WebDriver, Writing and Executing Test Scripts in Selenium (Java/Python), Unit Testing Tools (JUnit, TestNG, PyTest), Continuous Integration & Testing (Jenkins, GitHub Actions basics).	15
IV	Quality Assurance, Metrics, Software Quality Assurance (SQA) Principles, Defect Management: Lifecycle, Severity, Priority, Test Metrics and Measurements, Defect Density, Test Coverage, Test Effectiveness, Test Reporting and Documentation, Performance Testing (Intro to JMeter), Security Testing (OWASP basics), Agile and DevOps Testing, Behavior-Driven Development (BDD)	15

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20	**End-Term Examination:** A three-hour exam for theory of 70 marks.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Software Testing: Principles and Practices – Srinivasan Desikan & Gopalaswamy Ramesh (Pearson)
2. Software Testing: A Craftsman's Approach – Paul C. Jorgensen (CRC Press)
3. Foundations of Software Testing – Aditya P. Mathur (Pearson)
4. Foundations of Software Testing: ISTQB Certification – Dorothy Graham, Erik van Veenendaal & Rex Black (Cengage)
5. Software Testing: Principles, Techniques and Tools – M. G. Limaye (McGraw Hill)

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<tr><td>Subject</td><td colspan="3">Computer Science</td></tr>
<tr><td>Semester</td><td colspan="3">VII</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Data Mining and Warehousing</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CSE-703</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">CC-H3</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">400-499</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3"></td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Explain the fundamental concepts, architectures, and applications of data warehousing and data mining.
2. Apply data pre-processing, transformation, and integration techniques for preparing datasets.
3. Implement data mining methods such as classification, clustering, association, and prediction using suitable tools.
4. Analyze and evaluate the effectiveness of data warehousing and mining techniques for knowledge discovery and decision support.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>4</td><td>0</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>4</td><td>0</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks: 70</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
<tr><td colspan="4"><u>Instructions for Paper-Setter</u>
The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions, selecting one from each unit. First</td></tr>
</table>

question will be compulsory.

Unit	Topics	Contact Hours
I	Introduction to Data Warehousing, Overview of Data Warehousing, Differences between OLAP and OLTP, Data Warehouse Architecture, Data Marts and Metadata, ETL Process: Extraction, Transformation, Loading, Star, Snowflake, and Fact Constellation Schemas, OLAP Operations: Roll-up, Drill-down, Slice, Dice, Pivot.	15
II	Introduction to Data Mining: Definitions and Applications, Types of Data and Patterns, Data Cleaning, Integration, and Transformation, Data Reduction: PCA, Sampling, Binning Data Discretization and Normalization, Introduction to Data Mining Process (KDD)	15
III	Data Mining Techniques, Association Rule Mining: Market Basket Analysis, Apriori and FP-Growth Algorithms , Evaluation Metrics: Support, Confidence, Lift, Classification: Decision Trees (ID3, C4.5), Naive Bayes Classifier, k-NN, Logistic Regression, Model Evaluation: Confusion Matrix, ROC, AUC, Clustering: K-Means, Hierarchical Clustering, DBSCAN, Cluster Evaluation Measures	15
IV	Web Mining and Text Mining Basics, Spatial and Temporal Data Mining, Introduction to Big Data & Data Mining Tools (e.g., Hadoop, Spark), Data Mining Applications: Fraud Detection, Customer Relationship Management (CRM), Recommender Systems Ethical Issues in Data Mining: Privacy, Security, Bias	15

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory**

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 5
- Mid-Term Exam: 20

End-Term Examination: A three-hour exam for theory of 70 marks.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, and Jian Pei
- Data Warehousing in the Real World by Sam Anahory and Dennis Murray
- Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar

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<tr><td>Subject</td><td colspan="3">Computer Science</td></tr>
<tr><td>Semester</td><td colspan="3">VII</td></tr>
<tr><td>Name of the Course</td><td colspan="3">NoSQL Databases</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CSE-704</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">DSE6</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">400-499</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3"></td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Explain the principles, characteristics, and types of NoSQL databases.
2. Differentiate between relational and NoSQL databases in terms of data models, scalability, and performance.
3. Apply NoSQL techniques to model, store, and query unstructured and semi-structured data.
4. Use popular NoSQL databases (e.g., MongoDB, Cassandra, Redis) to design and implement real-world applications.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>4</td><td>0</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>4</td><td>0</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks: 70</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
<tr><td colspan="4"><u>Instructions for Paper-Setter</u>
The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions, selecting one from each unit. First</td></tr>
</table>

question will be compulsory.

Unit	Topics	Contact Hours
I	Introduction to NoSQL databases, Characteristics of NoSQL, CAP theorem, Comparison with relational databases, Types of NoSQL databases.	15
II	Key-Value Stores: Concepts, Data modeling, Operations, Use cases, Examples (Redis, Riak).	15
III	Document-Oriented Databases: JSON/XML-based data models, CRUD operations, Indexing, Aggregation, Examples (MongoDB, CouchDB).	15
IV	Column-Oriented and Graph Databases: Column family concepts (Cassandra, HBase), Graph database concepts (Neo4j), Query languages, Applications in big data and real-time analytics.	15

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory**

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 5
- Mid-Term Exam: 20

End-Term Examination: A three-hour exam for theory of 70 marks.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

 Pramod J. Sadalage & Martin Fowler – *NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence* (Addison-Wesley)

 Kristina Chodorow – *MongoDB: The Definitive Guide* (O'Reilly)

 C. Strauch – *NoSQL Databases* (Lecture Notes, Stuttgart Media University)

 Dan McCreary & Ann Kelly – *Making Sense of NoSQL* (Manning Publications)

 Eben Hewitt – *Cassandra: The Definitive Guide* (O'Reilly)

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<tr><td>Subject</td><td colspan="3">Computer Science</td></tr>
<tr><td>Semester</td><td colspan="3">VII</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Artificial Intelligence</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CSE-705</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">DSE6</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">400-499</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3"></td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Explain the fundamental concepts, history, and applications of Artificial Intelligence and analyze various problem-solving approaches
2. Apply appropriate methods of knowledge representation and reasoning using logic, rule-based systems, semantic networks, and probabilistic reasoning models
3. Implement and evaluate machine learning algorithms including supervised and unsupervised learning, neural networks, and model performance metrics to build intelligent systems
4. Integrate AI techniques in domains such as Natural Language Processing, Computer Vision, Robotics, and Healthcare, and examine ethical, social, and future implications of AI in society</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>4</td><td>0</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>4</td><td>0</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks: 70</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
<tr><td colspan="4"><u>Instructions for Paper-Setter</u>
The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions, selecting one from each unit. First</td></tr>
</table>

question will be compulsory.

Unit	Topics	Contact Hours
I	Definition, History, and Applications of AI, Intelligent Agents and Environments, State Space Search: Uninformed Search (BFS, DFS, UCS), Informed Search (A*, Greedy Search), Constraint Satisfaction Problems (CSP), Game Playing (Minimax, Alpha-Beta Pruning)	15
II	Knowledge Representation & Reasoning, Propositional Logic and Inference, First-Order Logic (FOL), Rule-Based Systems and Production Rules, Semantic Networks, Frames, Ontologies and Knowledge Graphs, Reasoning under Uncertainty: Bayesian Networks, Markov Models	15
III	Machine Learning and Data-Driven AI, Supervised Learning: Regression, Classification, Decision Trees, k-N, Naive Bayes, Unsupervised Learning: Clustering (K-means, Hierarchical), Dimensionality Reduction (PCA), Introduction to Neural Networks and Deep Learning, Model Evaluation: Accuracy, Precision, Recall, F1 Score	15
IV	Natural Language Processing: Text Preprocessing, Bag-of-Words, Word Embedding, Computer Vision Basics, Introduction to Reinforcement Learning, AI in Robotics, Healthcare, Finance, and Society, Ethical Considerations: Bias, Fairness, Accountability, AI and the Future of Work	15

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20	**End-Term Examination:** A three-hour exam for theory of 70 marks.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Artificial Intelligence: A Modern Approach by Russell & Norvig
- Pattern Recognition and Machine Learning by Christopher Bishop

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<tr><td>Semester</td><td colspan="3">VII</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Practical</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CSE-706</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">PC-H1</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">400-499</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3"></td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Apply data preprocessing, association rule mining, classification, and clustering techniques using suitable data mining tools (e.g., Weka, Python, R, or SQL-based tools).
2. Design and implement a simple data warehouse schema and perform OLAP operations for analytical decision-making.
3. Apply software testing concepts by designing and executing manual and automated test cases for different levels of testing such as unit, integration, system, and acceptance testing.
4. Use appropriate testing tools and techniques (e.g., Selenium, JUnit, Postman, Bugzilla) to evaluate software quality and generate detailed test reports.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>0</td><td>4</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>0</td><td>8</td><td>8</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks: 70</td><td colspan="2">Time: 6 Hrs.(P), Two-sittings of 3hrs. each</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
</table>

Sitting	Topics	Contact Hours
A	Candidate will do practicals based on following, but not limited to: • Data cleaning, integration, and transformation on sample datasets. • Implementation of association rule mining (Apriori / FP-Growth algorithms). • Classification using Decision Tree and Naïve Bayes algorithms. • Clustering using K-Means and Hierarchical methods. • Implementation of data normalization and discretization techniques. • Design of a star or snowflake schema for a sample data warehouse. • Implementation of OLAP operations: Roll-up, Drill-down, Slice, and Dice. • Mini project: Building a data mining or warehousing application (e.g., customer segmentation, sales analysis).	60
B	Candidate will do practicals based on following, but not limited to: • Write test cases for basic modules (e.g., login, registration, form validation). • Perform black-box testing using equivalence partitioning and boundary value analysis. • Conduct white-box testing using control flow and path coverage techniques. • Perform unit testing using JUnit (Java) or PyTest (Python). • Perform integration testing for a multi-module application. • Automate web application testing using Selenium WebDriver. • Conduct API testing using Postman and validate JSON responses. • Defect tracking and reporting using Bugzilla or JIRA. • Prepare a comprehensive test report and test summary document. • Mini project: Testing a small web or mobile application end-to-end.	60

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20	**End-Term Examination:** A six-hour exam having two sittings for practical of 70 marks.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

• Han, J., Kamber, M., & Pei, J. (2012). *Data Mining: Concepts and Techniques.* 3rd Edition, Morgan Kaufmann.
• Pang-Ning Tan, Steinbach, M., & Kumar, V. (2018). *Introduction to Data Mining.* Pearson Education.
• Inmon, W. H. (2005). *Building the Data Warehouse.* Wiley.
• Pujari, A. K. (2001). *Data Mining Techniques.* Universities Press.
• Korth, H. F., & Silberschatz, A. (2019). *Database System Concepts.* McGraw-Hill.
• Srinivasan Desikan & Gopalaswamy Ramesh (2006), *Software Testing: Principles and Practices*, Pearson Education.
• Pressman, R. S. & Maxim, B. R. (2019), *Software Engineering: A Practitioner's Approach*, 8th Ed., McGraw-Hill.
• Sommerville, Ian (2016), *Software Engineering*, 10th Ed., Pearson Education.

- Naik, K. & Tripathy, P. K. (2008), *Software Testing and Quality Assurance: Theory and Practice*, Wiley India.
- Patton, Ron (2014), *Software Testing*, 2nd Ed., Pearson Education.