**Course Specification**

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program me specification.

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| 1. Teaching Institution | **University of Al-Mustaqbal college of science** |
| 2. Department / Center | **Intelligent Medical Systems Department** |
| 3. Course Title /Code | Clinical Data Mining **MU03024103** |
| 4. Modes of Attendance Offered | Direct |
| 5. Semester/Year | 1/ 2025-2026 |
| 6. Number of Hours Tuition (Total) | 30 theory |
| 7. Date of Production of this Specification | 1-9-2025 |
| 8. Course Description | This course introduces the fundamental concepts and techniques of data mining with a focus on clinical applications. Students will explore how data warehousing and mining methods are applied to extract meaningful insights from healthcare data. The course covers the architecture and processes of data warehousing, data preprocessing, and online analytical processing (OLAP). Key data mining topics include classification, prediction, clustering, association rule mining, and outlier detection, with an emphasis on healthcare datasets. By the end of the course, students will have the skills to implement data mining techniques to enhance clinical decision-making, patient care, and research in the medical domain. |

9. Aims of the Course

1. **Understanding Data Warehousing and Data Mining Fundamentals**: To provide a comprehensive understanding of data warehousing concepts, including its architecture, components, and applications in clinical contexts.
2. **Exploring Data Mining Techniques**: To equip students with knowledge of various data mining methods, including classification, clustering, and association rule mining, tailored to solve healthcare-related problems.
3. **Application of Data Mining in Healthcare**: To demonstrate how data mining techniques can be leveraged to improve clinical decision-making, patient outcomes, and healthcare research.

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### A. Knowledge and Understanding

1. **Define Key Concepts**: Understand the core principles of data warehousing and data mining, including data preprocessing, OLAP, and knowledge discovery in databases (KDD).
2. **Identify Data Mining Techniques**: Describe various data mining techniques such as classification, clustering, association rule mining, and their application in clinical data analysis.
3. **Explain Data Mining Processes**: Comprehend the processes and methodologies for mining clinical data, including data preparation, model building, evaluation, and interpretation.
4. **Analyze Data Warehousing Components**: Explain the architecture, components, and stages of a data warehouse, and their role in supporting data mining tasks.
5. **Assess Healthcare Applications**: Recognize the role of data mining in healthcare, including use cases like disease prediction, patient management, and healthcare quality improvement.
6. **Address Ethical and Privacy Concerns**: Understand the ethical, legal, and privacy implications of applying data mining techniques to sensitive clinical data.

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Teaching and Learning Methods ( Select from No. 17)

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a. a. E-Learning
b. Self-Learning
c. Learning by Experimentation

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Assessment Methods ( Select from No. 18)

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a. **Quizzes and Tests**: Periodic quizzes to assess students' understanding of fundamental concepts, theories, and terminology in data warehousing and data mining.
b. **Assignments and Case Studies**: Application-based assignments and real-world case studies focused on implementing data mining techniques to analyze clinical datasets and interpret the results.
c. **Practical Lab Work**: Hands-on lab exercises using data mining tools (e.g., Python, R, Weka) to implement algorithms like classification, clustering, and association rule mining on clinical datasets.

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### B. Subject-Specific Skills.

-B1  Data Warehousing Design and Implementation
-B2 Data Preprocessing
-B3 Application of Data Mining Algorithms
-B4  Classification and Prediction

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Teaching and Learning Methods ( Select from No. 17)

a. E-Learning
b. Self-Learning
c. Learning by Experimentation

Assessment Methods ( Select from No. 18)

a.
b.
c,

**C. Critical Thinking Skills**

-C1.
-C2
-C3
-C4

Teaching and Learning Methods ( Select from No. 17)

a
b.

Assessment Methods ( Select from No. 18)

a.
b.
c.

**D. General and Transferable Skills.** ( Select from No. 16)

-D1
-D2
-D3
-D4

Teaching and Learning Methods ( Select from No. 17)

a. Achievement Tests
b. Standard Tests
c. Individual Skills Assessment
d. Selection of Intellectual Question in Achievement tests

Assessment Methods ( Select from No. 18)

a. Achievement Tests
b. Standard Tests

## 11. Course Structures

| Week | Hours | ILOs | Unit/Module or Topic Title | Teaching Method | Assessment Method |
|------|-------|------|----------------------------|-----------------|-------------------|
| 1 | 2 | .Understand the fundamentals of data warehousing, including its definition, history, and applications in clinical contexts. | Introduction to Data Warehousing | Lecture, Reading Assignments | Quiz, Class Discussion |
| 2 | 3 | Describe the three-tier architecture of a data warehouse and the role of metadata repositories and OLAP. | Data Warehouse Architecture | Lecture, Practical Lab Session | Assignment, Lab Work |
| 3 | 3 | Define data mining, its scope, and major tasks; understand the architecture and processes of data mining. | Data Mining Overview | Lecture, Case Studies | Quiz, Written Repor |
| 4 | 2 | Identify data mining systems and understand the KDD process. | Classification of Data Mining Systems & KDD | Lecture, Reading Assignments | Quiz, Class Discussion |
| 5 | 2 | Frequent Itemsets Mining Methods | Apply the Apriori Algorithm and mine multilevel association rules. | Lecture, Reading Assignments | Quiz, Class Discussion |
| Mid exam | | | | | |
| 7 | 2 | Build classification models using decision tree induction and Bayesian approaches. | Classification: Decision Trees & Bayesian Classification | Lecture, Reading Assignments | Quiz, Class Discussion |
| 8 | 2 | Implement genetic algorithms and fuzzy set approaches for classification. | Advanced Classification Techniques | Lecture, Reading Assignments | Quiz, Class Discussion |
| 9 | 2 | Implement genetic algorithms and fuzzy set approaches for classification. | Advanced Classification Techniques | Lecture, Reading Assignments | Quiz, Class Discussion |
| 10-13 | 2 | Apply clustering techniques and understand their role | Cluster Analysis | Lecture, Reading Assignments | Quiz, Class Discussion |

| | | in clinical data analysis. | | | |
|---|---|---|---|---|---|
| 14 | 2 | | | Lecture, Reading Assignments | Quiz, Class Discussion |
| 15 | 2 | | | Lecture, Reading Assignments | Quiz, Class Discussion |

| 12. Infrastructure : | |
|---|---|
| I. Textbooks:. | Han and M. Kamber, " Data Mining Tools and Technique s", Morgan Kaufmann Publishers. |
| II. References: | M.H. Dunham, " Data Mining Introductory and Adv anced Topics", Pear son Education. |
| III. Recommended reading: (Periodicals, Reports, …) | |
| IV. E-References, Websites, …. | |

| 13. Assessments: | | Type of Assessment Description | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weighting | Theory | | | | | Practical | | | | | |
| | Total | T.1 | T.2 | | Assig. | | Atten | T.1 | T.2 | Proj | | | Atten |
| Course Work | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Total | Theory | | | | | | Practical | | | | | |
| Final | 50 | 30 | | | | | | 20 | | | | | 50 |
| | | | | | | | | | | | | | |
| Total | | | | | | | | | | | | | |

| 14. Course Development Plan | |
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## 15. ABET/CAC

| Student Outcome | | Course Objectives | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | | | | |
| A | An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline | √ | √ | √ | √ | | | | | |
| B | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution | √ | √ | √ | √ | | | | | |
| C | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs | √ | √ | √ | √ | | | | | |
| D | An ability to function effectively on teams to accomplish a common goal | | | | | | | | | |
| E | An understanding of professional, ethical, legal, security and social issues and responsibilities | | | √ | | | | | | |
| F | An ability to communicate effectively with a range of audiences | | √ | √ | | | | | | |
| G | An ability to analyze the local and global impact of computing on individuals, organizations, and society | | √ | √ | √ | | | | | |
| H | Recognition of the need for and an ability to engage in continuing professional development | | | √ | | | | | | |
| I | An ability to use current techniques, skills, and tools necessary for computing practice | √ | √ | √ | √ | √ | | | | |
| Computer Science (CS) For CS Add (j &k) to (a – i) | | | | | | | | | | |
| Computer Science (CS) | | | | | | | | | | |
| J | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices | √ | √ | √ | √ | √ | | | | |
| K | An ability to apply design and development principles in the construction of software systems of varying complexity | √ | √ | √ | √ | | | | | |
| Information systems (IS) For IS Add (j) to (a – i) | | | | | | | | | | |
| Information systems (IS) | | | | | | | | | | |
| J | An understanding of processes that support the delivery and management of information systems within a specific application environment | | √ | √ | √ | | | | | |

| | Information Technology (IT)<br>For IT Add (j,k,l,m,n) to (a –i) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Information Technology (IT)** | | | | | | | | | | | |
| J | An ability to use and apply current technical concepts and practices in the core information technologies | √ | √ | √ | √ | | | | | | | |
| K | An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems | √ | √ | √ | √ | | | | | | | |
| L | An ability to effectively integrate IT-based solutions into the user environment | | √ | √ | √ | √ | | | | | | |
| M | An understanding of best practices and standards and their application | | √ | √ | | | | | | | | |
| N | An ability to assist in the creation of an effective project plan | | √ | | | | | | | | | |
| | (IB)  Information Business<br><br>Add fields according to IB | | | | | | | | | | | |
| | **Information Business (IB)** | | | | | | | | | | | |
| O | An ability to apply total quality management for it system and to develop the software. | | √ | √ | | | | | | | | |
| P | An ability to analyze quantitative models for business in a long term plan (strategy) in dynamic business. | | | √ | | | | | | | | |
| Q | An ability to apply E-process for organization. | | | √ | | | | | | | | |
| | | | | | | | | | | | | |

| 16. General and Transferable Skills |
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| a. Ability to adopt lifelong learning. |
| b. Ability to communicate information with other specialization. |
| c. Ability to solve problems. |
| d. Ability to communicate effectively with colleagues in work environment. |

| 17. Teaching and Learning Methods |
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| a. E-Learning |
| b. Self-Learning |
| c. Learning by Experimentation |
| d. Cooperative Learning |
| e. Brainstorming |

| f. Indirect Learning |
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| 18. Assessment Methods |
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| a. Achievement Tests |
| b. Standard Tests |
| c. Individual Skills Assessment |
| d. Selection of Intellectual Question in Achievement tests |
| e. Collage Peer Assessment |
| f. Collective Project |
| g. Project consist of Random groups of Students |
| h. Students Performance Assessment |
| i. Experience and Professionalism Assessment |