**Course Syllabus/Specification**

**Course Specification**

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| **A Deep Learning course typically covers the fundamentals of neural networks, their architectures, and applications in various fields. It introduces students to the fundamental principles of deep learning and** provides **hands-on experience in implementing deep learning model** |

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| 1. Teaching Institution | **University of Al-Mustaqbal**<br>**college of Science** |
| 2. Department / Center | **Intelligent Medical Systems Department** |
| 3. Course Title /Code | Deep Learning<br>**MU03024102** |
| 4. Modes of Attendance Offered | Full Time |
| 5. Semester/Year | Semester 1 / 2025-2026 |
| 6. Number of Hours Tuition (Total) | 30 hours |
| 7. Date of Production of this Specification | 1/9/2025 |
| 8. Course Description | This course will cover the basics of DL including how to build and train multilayer perceptron, convolutional neural networks (CNNs), recurrent neural networks (RNNs), auto-encoders (AE) and generative adversarial networks (GANs). Based on this course, students can design and build different projects, including cancer detection with CNNs, RNNs on disaster tweets, and generating dog images with GANs. |
| 9. Aims of the Course | |
| I. To make students comfortable with tools and techniques required in handling large amounts of datasets.<br>II. Gives a good understanding of the theoretical basis underlying neural networks and deep learning.<br>III. The course includes implementation of neural components and as well as applying deep learning on real-world data sets using modern deep learning packages.<br>IV. Several libraries and datasets publicly available will be used to illustrate the application of different DL algorithms. | |

10. Learning Outcomes, Teaching, Learning and Assessment Methods

**A. Knowledge and Understanding**

-A1. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
-A2. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
-A3. An understanding of best practices and standards and their applications.

Teaching and Learning Methods (Select from No. 17)

-E-Learning
-Self-Learning

Assessment Methods (Select from No. 18)

-Achievement Tests
- Standard Test.
- Selection of Intellectual Question in Achievement tests

**B. Subject-Specific Skills.**

-B1. An ability to use current techniques, skills, and tools necessary for computing practice.
-B2. An ability to apply E-process for organization.
- B3. The student's knowledge of the information needed to learn the methods and principles of scientific thinking and innovation and solve the scientific problems facing him, and the possibility of applying scientific facts and theories to concrete practical experiences.

Teaching and Learning Methods (Select from No. 17)

-E-Learning
-SelfLearning

Assessment Methods (Select from No. 18)

- Collective Project.

**C. Critical Thinking Skills**

-C1. An understanding of professional, ethical, legal, security and social issues and responsibilities

Teaching and Learning Methods (Select from No. 17)

- Indirect Learning

Assessment Methods (Select from No. 18)

- Students Performance Assessment

**D. General and Transferable Skills.** Select from No. 16)
-D1. Ability to adapt to lifelong learning.
-D2. Ability to solve problems

Teaching and Learning Methods (Select from No. 17)

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| -E-Learning<br>-Self-Learning |
| Assessment Methods (Select from No. 18) |
| -Achievement Tests<br>-Students Performance Assessment |

| 11. Course Structures | | | | | |
|---|---|---|---|---|---|
| Week | Hours | Unit/Module or Topic Title | ILOs | Teaching Method | Assessment Method |
| 1 | 2 | Introduction to Deep Learning | Covers foundational deep learning theory and practice | Direct learning E-learning | Students Performance Assessment |
| 2 | 2 | Back-propagation algorithm, Multi-layer Perceptron | Let students know the backpropagation and perceptron algorithms and how they work. | Direct learning E-learning | Students Performance Assessment |
| 3 | 2 | Training Neural Networks | Let students know the process of teaching a neural network to perform a task. | Direct learning E-learning | Quiz |
| 4 | 2 | Using Keras | Students can use Keras to solve machine learning problems because it covers every step of the machine learning workflow | Direct learning E-learning | Students Performance Assessment |
| 5 | 2 | Deep learning on Images | Students will study how can uses neural networks to learn useful representations of features directly from image. | Direct learning E-learning | Students Performance Assessment |
| 6 | 2 | CNN Architecture: Part 1 | Students will understand what CNN architecture is. What are the benefits of CNN? Why we use it? | Direct learning E-learning | Students Performance Assessment |
| 7 | 2 | CNN Architecture: Part 2 | Students will study what are the main | Direct learning E-learning | Students Performance |

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| | | | applications of CNN? | | Assessment |
| 8 | 2 | Special Type of RNNS | Students will study the types of RNN? | Direct learning E-learning | Students Performance Assessment |
| 9 | 2 | Mid exam 1 | Students will perform an examination administered in the middle of an academic term | Direct learning E-learning | Students Performance Assessment |
| 10 | 2 | Unsupervised Approaches on Deep Learning | Let students know how to use genetics to solve problem using python lang. | Direct learning E-learning | Quiz |
| 11 | 2 | Generative Adversarial Networks (GANs) | Let students know how can use a chromosome and gen to represent complex problems can implements using python lang. | Direct learning E-learning | Students Performance Assessment Achievement Tests |
| 12 | 2 | Object detection in deep learning: Part 1 | Let's students know how can use These agents can manipulate this. knowledge to infer new things at the "Knowledge level" | Direct learning E-learning | Students Performance Assessment Achievement Tests |
| 13 | 2 | Mid exam 2 | | | |
| 14 | 2 | Object detection in deep learning: Part 2 | Let students know how can use Models, Inference and Entailment | Direct learning E-learning | Students Performance Assessment Achievement Tests |
| 15 | 2 | Final exam | | | |

15. ABET/CAC

| | Student Outcome | Course Objectives | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A | An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline | I | II | III | IV | V | VI | VII | | | |
| 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)<br>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)<br>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 | √ | √ | √ | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 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>Add fields according to IB | | | | | | | | | | | |
| | Information Business (IB) | | | | | | | | | | |
| o | An ability to apply total quality management for its 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. | √ | | | | | | | | | |

| 12.Infrastructure | |
|---|---|
| I. Textbooks: | Artificial Intelligence a Modern Approach (3rd Edition)<br>*Constructing Intelligent Agent with JAVA_full* |
| II. References: | |
| III.Recommended reading: (Periodicals, Reports …) | N. A |
| IV.E-References, Websites. | |

| 13. Assessments: | | Type of Assessment Description | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weighting | Theory | | | | | | Practical | | | |
| Course Work | Total | T.1 | T.2 | Q1 | Q2 | Assig. | Atten | T.1 | T.2 | Assig. | Atten |
| | 50 | 22 | 22 | | | 4 | 2 | | | | |
| | | | | | | | | | | | |
| Final | Total | Theory | | | | | | Practical | | | |
| | 50 | | | | | | | | | | |
| | | | | | | | | | | | |
| Total | 100 | | | | | | | | | | |

| 14. Course Development Plan |
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| N. A |

| 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 |
| g. Direct Learning |

| 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 PeerAssessment |
| f. Collective Project |
| g. Project consist of Random groups of Students |
| h. Students Performance Assessment |
| i. Experience and Professionalism Assessment |