Sana'a University
Faculty of Engineering
Electrical Engineering Department
B.Sc. of Computer and Control Engineering

Course Specification of Artificial Intelligence

I. Course Identification and General Information

1.	Course Title:	Artificial Intelligence				
2.	Course Code &Number:	CCE326				
3.	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	3
4.	Study level/ semester at which this course is offered:	Level 4- Semester 2				
5.	Pre –requisite (if any):	Data Structure and Algorithms (CCE246)				
6.	Co –requisite (if any):	None.				
8.	Program (s) in which the course is offered:	B.Sc. of Computer and Control Engineering				
9.	Language of teaching the course:	Arabic & English				
10.	Location of teaching the course:	Class Room (Faculty of Engineering)				
11.	Prepared By:	Prof. Abdul Raqib Abdo Asaad				
12.	Date of Approval					

II. Course Description

This course aims to provide students with basic principles and problem-solving techniques in Artificial Intelligence (AI), which become the dominant branch in information technology field with its wide applications. Course topics cover the foundation of AI, AI programming language, AI problems, problem solving and searching algorithms, knowledge representation, reasoning, planning, and applications. This course depends on lectures and computer-based lab. In addition, it depends on Data Structure and Algorithms as prerequisite which expected to develop student's problem-solving skills related to AI and its wide applications in IT field.

III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1	Explain the concepts and problem-solving techniques in AI.	A1, A2, A3, A4

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Prof. Dr. Abdul Raqib Abdo Asaad	Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad

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a2	Recognize the connection between problem solving and searching algorithms.	
b1	Solve problems using AI techniques.	B1, B2, B3, B4
b2	Justify the problems solve according to the demand requirements.	
c1	Familiar with AI software and AI programming languages	C1, C2, C4
c2	Write AI programs using AI programing languages for different applications in the field of AI.	
d1	Work in a group to achieve final course's project or during laboratory activities.	D1
d2	Follow the standards to achieve his reports and presentations.	D4

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Explain the concepts and problem-solving techniques in AI.	• Active Lectures, • Interactive class discussions, • Laboratory, • Assignments.	• Examinations, • Reports, • Presentations.
a2- Recognize the connection between problem solving and searching algorithms.	• Active Lectures, • Interactive class discussions, • Laboratory, • Assignments.	• Examinations, • Reports, • Presentations.

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Solve IT-based problems using AI techniques.	• Active Lectures, • Laboratory, • Assignments,	• Examinations, • Reports, • Presentations.

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		• Project.	
b2-	Justify the problems solve according to the demand requirements.	• Active Lectures, • Laboratory, • Assignments, • Project.	• Examinations, • Reports, • Presentations.

(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies			
Course Intended Learning Outcomes		Teaching strategies	Assessment Strategies
c1-	Apply AI software & programming languages in solving problems related to AI applications.	• Laboratory, • Assignments, • Project.	• Lab Reports, • Project Reports, • Presentations.
c2-	Write AI programs using AI programing languages to different applications in the field of AI.	• Laboratory, • Assignments, • Project.	• Lab Reports, • Project Reports, • Presentations.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies			
Course Intended Learning Outcomes		**Teaching strategies**	**Assessment Strategies**
d1-	Work in a group to achieve final course's project or during laboratory activities.	• Laboratory • Project	• Observation, • Reports, • Presentations.
d2-	Follow the standards to achieve his reports and presentations.	• Use of Information Technology Tools, • Assignments, • Project.	• Reports, • Presentations.

IV. Course Content

A – Theoretical Aspect

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Prof. Dr. Abdul Raqib Abdo Asaad	Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad

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Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	AI Overview	a1, c1	• What is AI? • Foundations of AI • AI problems • Introduction to AI languages • AI techniques • Intelligent agents • Agent structure • Nature of environment	2	4
2.	Problem-Solving & Search	a1, a2, b1, b2	• Problem-solving (with example problems) • Searching for solution • uninformed search strategies • Heuristic search strategies • Heuristic functions • Local search algorithms and optimization problems • Searching with nondeterministic action • Searching with partial observation	5	10
3.	Game Playing Overview	a1, b1, b2	• Optimal decisions in games (the minimax algorithm, optimal decision in multiplayer games) • Alpha-beta pruning	2	4
4.	Knowledge, Reasoning, and Planning	a1, b1, b2	• Logical agents • First-order logic • Inference in first-order logic • Planning and acting in the real world • Classical planning • Knowledge structure • Knowledge representation paradigms	5	10

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Asst. Prof. Dr. Adel Ahmed Al-Shakiri

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Prof. Dr. Mohammed AL-Bukhaiti

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Number of Weeks /and Units Per Semester	**14**	**28**

B - Practical Aspect

Order	Topics List	Number of Weeks	Contact hours	Learning Outcomes
1.	AI programming language: Basic concepts	1	2	a1, c1
2.	AI programming language (cont.)	2	4	a1, c1, c2
3.	Using the AI prog. language in Machine Learning	2	4	a1, b1, b2, c1, c2, d1
4.	Using the AI prog. language in Logic Programming	2	4	a1, b1, b2, c1, c2, d1
5.	Using the AI prog. language in Heuristic Search	2	4	a1, b1, b2, c1, c2, d1
6.	Using the AI prog. language in Gaming	2	4	a1, b1, b2, c1, c2, d1
7.	Review	1	2	a1, b1, b2, c1, c2, d1, d2
8.	AI Projects Presentations	2	4	a1, b1, b2, c1, c2, d1
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course

- Active Lectures,
- Interactive class discussions,
- Laboratory,
- Assignments,
- Use of Information Technology Tools
- Projects.

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VI. Assignments & Reports:

No	Assignments	Aligned CILOs	Week Due	Mark
1.	• Homework on Problem Solving and AI Searching Techniques, • Searching web and prepare short report on AI's Problem-solving.	a1, a2, b1, b2, d2	3rd to 5th	3
2.	• Homework and Report on Game Playing, Knowledge Reasoning & Planning	a1, b1, b2, c1, d2	9th to 14th	3
3.	• Laboratory Reports	a1, b1, b2, c1, c2, d1	2nd to 11th	9
	Total			**15**

VII. Schedule of Assessment Tasks for Students during the Semester

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignments & Reports	3rd to 14th	15	10%	a1, a2, b1, b2, c1, c2, d1, d2
2.	Quizzes	5th, 10th & 14th	7.5	5%	a1, a2, b1, b2, c2
3.	Midterm Exam (Theory)	8th	18.75	12.5%	a1, a2, b1, b2
4.	Final Lab. Exam (including Course Project Evaluation)	13th, 14th & 15th	33.75	22.5%	a1, a2, b1, b2, c1, c2, d1, d2
5.	Final Exam (Theory)	16th	75	50%	a1, a2, b1, b2
Total			**150**	**100%**	

VIII. Learning Resources

Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two)

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	1) Stuart Russell and Peter Norvig (2009), "Artificial Intelligence: A Modern Approach", Third Edition, Pearson. 2) Elaine Rich and Kevin Knight (2010), "Artificial Intelligence", Third Edition, McGraw-Hill.
2- Essential References	
	1) Zsolt Nagy (2018), "Artificial Intelligence and Machine Learning Fundamentals", Packt Publishing, ISBN 978-1-78980-165-1. 2) Winston (1992), "Artificial Intelligence", Third Edition, Pearson. 3) George F. Luger (2008), "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Sixth Edition, Pearson.
3- Electronic Materials and Web Sites etc.	

IX. Course Policies:

1.	**Class Attendance:** -A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	**Assignments & Projects:** - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: - For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.

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6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Assoc. Prof. Dr. Farouk Al-Fuhaidy**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

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Course Plan (Syllabus) of Artificial Intelligence

I. Information about Faculty Member Responsible for the Course							
Name of Faculty Member	Prof. Dr. Abdul Raqib Abdo Asaad	**Office Hours**					
Location&Telephone No.		**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail							

II. Course Identification and General Information						
1-	Course Title:	Artificial Intelligence				
2-	Course Number & Code:	CCE326				
3-	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	3
4-	Study level/year at which this course is offered:	Level 4- Semester 2				
5-	Pre –requisite (if any):	Data Structure and Algorithms (CCE246)				
6-	Co –requisite (if any):	None.				
7-	Program (s) in which the course is offered	B.Sc. of Computer and Control Engineering				
8-	Language of teaching the course:	Arabic & English				
9-	System of Study:	Semesters				

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10-	Mode of delivery:	Collective and individual learning
11-	Location of teaching the course:	Class Room (Faculty of Engineering)

III. Course Description

This course aims to provide students with basic principles and problem-solving techniques in Artificial Intelligence (AI), which become the dominant branch in information technology field with its wide applications. Course topics cover the foundation of AI, AI programming language, AI problems, problem solving and searching algorithms, knowledge representation, reasoning, planning, and applications. This course depends on lectures and computer-based lab. In addition, it depends on Data Structure and Algorithms as prerequisite which expected to develop student's problem-solving skills related to AI and its wide applications in IT field.This course depends on lectures and practical parts. In addition, it depends on Data Structure and Algorithms as prerequisite.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop**:**

1. Explain the concepts and problem-solving techniques in AI.
2. Recognize the connection between problem solving and searching algorithms.
3. Solve IT-based problems using AI techniques.
4. Justify the problems solve according to the demand requirements.
5. Apply AI software & programming languages in solving problems related to AI applications.
6. Write AI programs using AI programing languages to different applications in the field of AI.
7. Work in a group to achieve final course's project or during laboratory activities.
8. Follow the standards to achieve his reports and presentations.

V. Course Content:

- Distribution of Semester Weekly Plan of Course Topics/Items and Activities

A – Theoretical Aspect:

Order	Topics List	Sub Topics List	Week Due	Contact Hours

1.	AI Overview	• What is AI? • Foundations of AI • AI problems • Introduction to AI languages • AI techniques • Intelligent agents • Agent structure • Nature of environment	1st, 2nd	4
2.	Problem-Solving & Search	• Problem-solving (with example problems) • Searching for solution • uninformed search strategies • Heuristic search strategies • Heuristic functions • Local search algorithms and optimization problems • Searching with nondeterministic action • Searching with partial observation	3rd, 4th, 5th, 6th, 7th	10
3.	Midterm Exam	• All previous topics	8th	2
4.	Game Playing Overview	• Optimal decisions in games (the minimax algorithm, optimal decision in multiplayer games) • Alpha-beta pruning	9th, 10th	4
5.	Knowledge, Reasoning, and Planning	• Logical agents • First-order logic • Inference in first-order logic • Planning and acting in the real world • Classical planning • Knowledge structure • Knowledge representation paradigms	11th, 12th, 13th, 14th, 15th	10
6.	Final Exam	• All topics	16th	2

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Number of Weeks /and Units Per Semester	16	32

B - Practical Aspect

Order	Topics List	Number of Weeks	Contact hours
1.	AI programming language: Basic concepts	1st	2
2.	AI programming language (cont.)	2nd, 3rd	4
3.	Using the AI prog. language in Machine Learning	4th, 5th	4
4.	Using the AI prog. language in Logic Programming	6th, 7th	4
5.	Using the AI prog. language in Heuristic Search	8th, 9th	4
6.	Using the AI prog. language in Gaming	10th, 11th	4
7.	Review	12th	
8.	AI Projects Presentations	13th, 14th	4
9.	Final Lab. Exam	15th	2
Number of Weeks /and Units Per Semester		**15**	**30**

VI. Teaching strategies of the course:

- Active Lectures,
- Interactive class discussions,
- Laboratory,
- Assignments,
- Use of Information Technology Tools
- Projects.

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VII. Assignments & Reports:

No.	Assignments	Week Due	Mark
1.	• Homework on Problem Solving and AI Searching Techniques, • Searching web and prepare short report on AI's Problem-solving.	3rd to 5th	3
2.	• Homework and Report on Game Playing, Knowledge Reasoning & Planning	9th to 14th	3
3.	• Laboratory Reports	2nd to 11th	9
	Total		**15**

VIII. Schedule of Assessment Tasks for Students during the Semester:

No.	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1.	Assignments & Reports	3rd to 14th	15	10%
2.	Quizzes	5th, 10th & 14th	7.5	5%
3.	Midterm Exam (Theory)	8th	18.75	12.5%
4.	Final Lab. Exam (including Course Project Evaluation)	13th, 14th & 15th	33.75	22.5%
5.	Final Exam (Theory)	16th	75	50%
Total			**150**	**100%**

IX. Learning Resources:

1- Required Textbook(s)

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6.	**Plagiarism**:

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