Course Specification
(Bachelor)

Course Title:	Artificial Intelligence
Course Code:	CS1505
Program:	Computer Science
Department:	Computer Science and Engineering
College:	Computer Science and information technology
Institution:	Al-Baha University
Version:	TP-153 – V1
Last Revision Date:	October 9, 2023

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A. General information about the course:

1. Course Identification

1. Credit hours: (4 Hours)					
2. Course type					
A.	☐University	☐College	☐Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 8 / 3rd Year)					
4. Course general Description:					

Artificial Intelligence (AI) has emerged as a transformative field in the world of technology, affecting various industries, from healthcare and finance to entertainment and transportation. This course in Artificial Intelligence provides students with a comprehensive introduction to the principles, techniques, and applications of AI. It equips students with the foundational knowledge and practical skills needed to understand, develop, and deploy AI systems in real-world contexts.

Lecture:

This course introduces students to the field of Artificial Intelligence (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach. It explores the essential theory behind methodologies for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience, and following problem-solving strategies found in nature. This course is intended to bring to the students the information necessary to understand the design, operation, and capabilities of intelligent systems. Students will be introduced to the fundamental concepts of machine learning with neural and fuzzy components. Topics to be covered include intelligent agents, heuristic search techniques, problem-solving as a search activity, knowledge representation, probabilistic reasoning, machine learning, neural networks, genetic algorithms, self-organizing systems, swarm computing, and biologically inspired computing.

Lab:

The role of the lab is to educate students the concepts and techniques of modern Intelligent Systems such as Machine Learning, and Intelligent Agents. The Lab introduces practical implementation in Artificial Intelligence and Multiagent Systems in the intersections of multiagent learning, decision making under uncertainty, and game theory. The lab introduces methods on content extraction from multimedia information through the application of natural language processing, text analysis, signal, image and video analysis. Machine learning research in the lab spans various aspects, such as clustering and classification. Our emphasis is placed on reinforcement learning, whereby an autonomous agent learns how to act rationally in an unknown environment through trial and error. In addition, our lab focuses on the computational intelligence; the techniques and methods used to tackle problems not well solved by traditional approaches to computing such as fuzzy logic, neural networks, evolutionary computing and knowledge-based systems.

5. Pre-requirements for this course (if any):

6. Pre-requirements for this course (if any):

7. Course Main Objective(s):

This course provides a broad overview of intelligent systems. The objective of this course is to provide students an opportunity to study some selected aspects of computational intelligence methods. Students will be introduced to Evolutionary Computation (EC), and Natural Language Processing (NLP).Students enrolled in this class and having successfully completed this course, will be able to:

- Outline the intelligent systems fundamental principles.
- State knowledge representation techniques.
- Recognize neural networks, genetic algorithms, fuzzy logic, swarm computing, biologically inspired computing, expert systems, and machine learning techniques, among others.
- Explain when and how to apply intelligent systems techniques.
- Evaluate and test intelligent systems techniques.
- Compare with current trends and applications relates to the course.
- Interact in groups collaboratively.

Communicate concepts and techniques in oral presentations.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	60%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		
5.	Other	22	40%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	33
2.	**Laboratory/Studio**	22
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		55

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Describe the intelligent systems fundamental principles	K1	● Lectures ● Slide Presentations	● Homework ● Midterm exam ● Final exam
1.2	Describe knowledge representation techniques	K2	● Lectures ● Slide Presentations	● Homework ● Midterm exam ● Final exam
1.3…	Understand neural networks, genetic algorithms, fuzzy logic, swarm computing, biologically inspired computing, expert systems, and machine learning techniques, among others	K1	● Lectures ● Slide Presentations	● Homework ● Midterm exam ● Final exam
2.0	**Skills**			
2.1	Compare intelligent systems techniques and deployments	S1	● Demonstrations ● Labs Lectures ● Group Discussion ● Group Projects ● Case Studies ● Practical Exercises	● Homework ● Midterm exam ● Final exam
2.2	Evaluate intelligent systems techniques	S1	● Demonstrations ● Labs Lectures ● Group Discussion ● Group Projects ● Case Studies ● Practical Exercises	● Quizzes ● Midterm exams ● Lab exercises (Rubric) ● Final Exam
2.3	Explore current trends and applications relates to intelligent systems	S3	● Demonstrations ● Labs Lectures ● Group Discussion ● Group Projects ● Case Studies ● Practical Exercises	● Project Assessment (Rubric)
3.0	**Values, autonomy, and responsibility**			
3.1	Interact in groups collaboratively	V1	● Small Group and Oral Presentations	● Lab exercises (Rubric)

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Intelligent Systems	4
2.	Introduction to Knowledge Representation and Reasoning	4
3.	Search and computational complexity in Intelligent Systems	4
4.	Natural language understanding	2
5.	Introduction to Machine Learning	2
6.	Neural Networks	4
7.	Genetic Algorithms	3
8.	Probabilistic Reasoning and Bayesian Belief Networks	2
9.	Fuzzy logic Reasoning	4
10.	Intelligent Agents	4
Total		**33**

No	List of Topics - Lab	Contact Hours
1.	Introduction to Artificial Intelligence and building an intelligent agent.	1
2.	Solving problems using logic programming (Validating primes – Parsing a family tree)	3
3.	Heuristic Search Techniques (Constructing a string using greedy search, solving a problem with constraints, building an 8-puzzle solver)	4
4.	Genetic Algorithms (Solving the symbol regression problem – Buildingan intelligent robot controller)	3
5.	Building Games with Artificial Intelligence (Building a bot to play Tic-Tac-Toe)	3
6.	Probabilistic Reasoning for Sequential Data (Generating data using Hidden Markov Models)	1
7.	Artificial Neural Networks (Constructing a single layer neural network - Constructing a multilayer neural network)	3
8.	Reinforcement Learning (Building a learning agent)	1
9.	Deep Learning with Convolutional Neural Networks (Building a perceptron-based linear regressor)	3
Total		**22**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Weekly homework exercises and/or programming assignment	Weekly	10%
2.	Quizzes	Periodically	5%
3.	Midterm	6	20%
4	Project	12	5%
5	Lab Exam	12	20%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
6	Final Exam	13	40%
7	**Total**	-	100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Russell, S. J. 1., Norvig, P., & Davis, E. (2010). *Artificial intelligence: a modern approach.* 3rd ed. Upper Saddle River, NJ, Prentice Hall.
Supportive References	Joshi, P. (2017). *Artificial intelligence with python*. Packt Publishing Ltd.
Electronic Materials	- Access to the Saudi digital library SDL. - Using the learning management system of the university—Rafid System: https://lms.bu.edu.sa.
Other Learning Materials	Python

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • A classroom or lecture hall with whiteboard for 25 students. Laboratory with 25 computers.
Technology equipment (projector, smart board, software)	Technology resources (AV, data show, Smart Board, software, etc.) • White board + data show + software • All students shall have - A laptop or access to a desktop computer with access to an intelligent - systems development tool - High speed Internet connection Power outlets for student's laptop plug-in
Other equipment (depending on the nature of the specialty)	The laboratory will have access to the latest version of the most popular intelligent systems development tools.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	● Students ● Faculty ● Peer Reviewers ● Program Leader Course Coordinator	● Surveys (indirect). ● Direct feedback from students (interview between Program leader and students). ● Course evaluation by Peer Reviewers (indirect). ● Class visit by Program Leader Comprehensive Course report (where we can find information about teaching difficulties and action plan, …)
Effectiveness of Students assessment	● Students ● Faculty ● Peer Reviewers ● Course Coordinator ● Exam Evaluation Committee Course Coordinator	● Surveys (indirect). ● Direct feedback from students (interview between Program leader and students). ● Assessment results (direct) ● Course evaluation by Peer Reviewers (indirect). ● Comprehensive Course report (where we can find information about assessment difficulties and action plan, …) Exam evaluation by the Exam Evaluation Committee (indirect)
Quality of learning resources	● Students ● Faculty ● Peer Reviewers Course Coordinator	● Surveys (indirect) ● Course evaluation by Peer Reviewers (indirect). Comprehensive Course report (where we can find information about difficulties and challenges about learning resources as well as consequences and action plan, …)
The extent to which CLOs have been achieved	● Faculty ● Program Leader ● Course Coordinator	● Student Results (direct) Comprehensive Course report (where we can find the CLO assessment results)
Other	None	None

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	

REFERENCE NO.	
DATE	**October 9, 2023**