هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

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Course Title:	**New Technologies and Trends**
Course Code:	**2251 CSA**
Program:	**Information Systems & WMAD**
Department:	**NA**
College:	**Applied College**
Institution:	**King Khalid University**
Version:	**1**
Last Revision Date:	**7 August 2023**

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A. General information about the course:

Course Identification					
1. Credit hours:	2				
2. Course type					
a.	University ☐	College ☐	Department☐	Track☐	Others☒
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	4th Level				
4. Course general Description: Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Artificial Intelligence, Machine Learning, Internet Of Things and Block chain technology. Graduates will have the ability to explore research areas and produce outstanding contribution in various areas current trends & technology.					
5. Pre-requirements for this course (if any):					
6. Co- requirements for this course (if any):					
7. Course Main Objective(s): This course is intended to: • Provide knowledge of Internet of Things: application scenarios, current solutions. • Acquire advanced Data Analysis skills. • Acquire knowledge on intelligent systems and agents, formalization of knowledge, reasoning with and without uncertainty, machine learning and applications at a basic level. Learn the basics of block chain technology to discover why businesses worldwide are adopting it.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	32	100
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	32
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	32

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	Identify and apply the appropriate machine learning techniques for classification, Pattern recognition, and optimization and decision problems.	k2	Lectures	Exams, Assignments and Quizzes
1.2	Acquire Knowledge in various learning techniques like decision tree, Analytical, Inductive and Reinforced learning.	k1 k2	Lectures	Exams, Assignments and Quizzes
2.0	Skills			
2.1	Ability to design fully connected products by integrating Internet services and physical objects	s1	Lectures	Exams and Assignments
2.2	Ability to analyze, design and develop prototypes of Internet-connected products using appropriate tools.	s1 s2	Lectures	Exams and Assignments
2.3	Understand emerging abstract models for Blockchain Technology	s3 s2	Lectures	Exams and Assignments
3.0	Values, autonomy, and responsibility			
3.1	Apply hyperledger Fabric and Etherum platform to implement the Block chain Application.	v2	Lectures	Exams, Assignments and presentation

C. Course Content

No	List of Topics	Contact Hours
1.	Artificial Intelligence : INTELLIGENT AGENTS AND PROBLEM SOLVING Introduction- Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.	3

	Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Avoiding Repeated States, Searching with Partial Information.	
2.	Artificial Intelligence :SEARCH METHODS Informed Search and Exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Online Search Agents and Unknown Environments, Generic Algorithms for TSP. Constraint Satisfaction Problems: Constraint Satisfaction Problems, Backtracking Search for CSPs, Local Search for Constraint Satisfaction Problems, Structure of Problems.	5
3.	MACHINE LEARNING: **INTRODUCTION** Machine learning -Examples of Machine Learning applications-Learning Associations-Classification-Regression-Unsupervised Learning-Reinforcement Learning-Supervised learning: Learning a class from Examples-Regression-Model Selection and Generalization **Case Study:** Familiarity with R tool and Python programming language and libraries	5
4.	MACHINE LEARNING: **CONCEPT LEARNING AND DECISION-TREE LEARNING** Concept Learning - Concept learning Task – Concept Learning as search –Finding a maximally specific hypothesis – Version Spaces and Candidate elimination Algorithm –Inductive Bias Decision Tree Learning - Decision Tree representation –Problems for Decision Tree Learning –Hypothesis Search space – Inductive Bias in Decision Tree Learning – Issues in Decision Tree Learning **Case Study:** Implementation of decision tree algorithm for problems in Retail Domain.	5
5.	Internet Of Things: **INTRODUCTION** Smart Objects – Challenges for Smart Objects - IP for Smart Objects: motivation and main challenges – Security for Smart objects – Web services for Smart Objects – Connectivity models for Smart Object Networks - Introduction to the Internet of Things: application scenarios, current solutions	4
6.	Internet Of Things: **SMART OBJECTS AND LLNS** Hardware and Software – Energy Management – Communication for Smart Objects : IEEE 802.15.4: main features, topologies, addressing and MAC frame format - Low Power and Lossy Networks (LLN): Introduction to 6LoWPAN - 6LoWPAN architecture: simple, extended and ad-hoc networks - 6LoWPAN adaptation layer -Issues in determining IPv6 links in LLNs - IPv6 addressing in 6LoWPAN-6LoWPAN forwarding: route-over and mesh under approaches-	4

	Neighbor Discovery optimizations and extensions to the ND protocol for 6LoWPAN networks	
7.	Blockchain Technology: **INTRODUCTION TO BLOCKCHAIN** Blockchain- Public Ledgers, Blockchain as Public Ledgers -Bitcoin, Blockchain 2.0, Smart Contracts, Block in a Blockchain, Transactions- Distributed Consensus, The Chain and the Longest Chain - Cryptocurrency to Blockchain 2.0 - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree	4
	BLOCKCHAIN APPLICATIONS Internet of Things-Medical Record Management System-Blockchain in Government and Blockchain Security-Blockchain Use Cases –Finance	
	Revision	2
Total		32

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz 1	4	5
2.	Midterm Exam 1	7	15
3.	Midterm Exam 2	12	15
4.	Quiz 2	14	5
5.	Assignments	5 - 15	20
6.	Final Exam	After week 16	40

*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	**Artificial Intelligence:** 1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Publication, 2nd Edition. 2. Jeff Heaton, Artificial Intelligence for Humans-Fundamental Algorithms, Create space Independent Pub; 1st edition, 2013. 2. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann. **Machine Learning:** Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press, September 2014, ISBN 978-0-262-02818-9. Mitchell, Tom, "Machine Learning", New York, McGraw-Hill. **Internet Of Things:** 1. J.-P. Vasseur, A. Dunkels, "Interconnecting Smart Objects with IP: The Next Internet", Morgan Kaufmann, 2010. 2. Z. Shelby, C, "Bormann. 6LoWPAN: The Wireless Embedded Internet", Wiley, 2009 **Blockchain:** 1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Bashir, Imran,2017. 2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
Supportive References	

	Z. Shelby, K. Hartke, K. Hartke, "The Constrained Application Protocol (CoAP)", RFC 7252, 2014. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.
Electronic Materials	https://lms.kku.edu.sa/
Other Learning Materials	Python and R tool Datasets available at i. https://www.kaggle.com ii. http://archive.ics.uci.edu/ml/datasets.html

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture Room with enough capacity Chairs Projector/Screen.
Technology equipment (projector, smart board, software)	Projector and smart board
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of students assessment	Course Teacher	Direct
Quality of learning resources	Program Supervisor, Quality Unit	Direct
The extent to which CLOs have been achieved	Course Teacher	Direct
Other	Course Teacher, Quality Unit	Direct

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	
REFERENCE NO.	

DATE	