College of Engineering

Department of Computer Engineering

Course Syllabus/Specification

Course Code and title	**ECCE 501: Introduction to Information Security**
Weight:	**(3 - 0 - 3)**
Prerequisite:	**None**
NQF Level Allocated	**8** **NQF Notional Hours / Credits: 120/12**
Description:	This course will cover the most important features of computer security, including topics such as cryptography, software security, malicious software, and network security. After completing this course, students will be able to analyze, design, and build secure systems of moderate complexity.
Objectives:	The objectives of the course are to :

1. Overview various computer security threats and countermeasures to that threats.
2. Gain understanding of software and operating system security.
3. Implement symmetric-key (shared secret key) and asymmetric-key (public-private key) encryption.
4. Design and imply the concepts of Internet Security Protocols and Standards.
5. Write and formulate access control polices of users for a given system.
6. Perform IT Security management and risk assessment
7. Formulate a computer and network security strategy.

SEMESTER:	First	**ACADEMIC YEAR:**	2019-2020
INSTRUCTOR:	Dr. Ammar Sami Al-Dallal		
OFFICE TEL.:	17298999 Ext. 8914		
EMAIL:	aaldallal@ahlia.edu.bh		

Intended Learning Outcomes (ILOs)

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate a critical knowledge and understanding of properties, techniques, concepts, principles and theories relating to security services	**Knowledge**: Theoretical understanding [Level 9]
A2	**Contemporary Trends, Problems and Research**: Gain a *critical* understanding of research methods/investigation techniques to shed light of current threats and countermeasures with respect to computer security	**Knowledge**: Theoretical Understanding [Level 9]
A3	**Professional Responsibility**: understand *detailed knowledge* of the role cryptography as a tool for deploying security software"	**Knowledge:** Theoretical Understanding. [Level 9]

B. Subject-Specific Skills		NQF Descriptor/ Level
B1	**Problem Solving**: Perform *advanced* calculations with respect to computer security	**Knowledge**: Practical application [Level 9]
B2	**Modeling and Design**: *Demonstrate creativity and* design a computer based security system to address a range of security problems (software, operating system and networks)	**Skills**: Generic problem solving & Analytical Skills [Level 9] **Knowledge**: Practical application [Level 9]
B3	**Application of Methods and Tools**: apply *advanced* security tools and techniques to encrypt/decrypt messages with a focus on cryptographic algorithms such as DES, AES and RSA"	**Skills**: Communication, ICT and Numeracy [Level 9]

C. Thinking Skills		NQF Descriptor/ Level
C1	**Analytic**: *Critically* analyze the scale of threats with respect to software, operating system and networks to evaluate the effectiveness of countermeasures.	**Skills**: Generic problem solving & Analytical Skills [Level 9]
C2	**Synthetic**: *Identify* and integrate a range of security solutions to address computer security threats.	**Skills**: Generic problem solving & Analytical Skills [Level 9]

	D. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)	NQF Descriptor/ Level
D1	**Communication**: Express and communicate effectively with persons and specialists and be able to make formal presentation in the area of computer security.	**Skills**: Communication, ICT and Numeracy [Level 9]
D2	**Teamwork and Leadership**: Work effectively as a member of a project team and demonstrate understanding of individual responsibility within the team	**Competence**: Autonomy, Responsibility and Context [Level 9]
D4	Ethical and Social Responsibility: Emphasis on personal and organizational ethics and accept accountability for conducting independent learning according to ethical and social norms in the field of computer security.	Context [Level 9] **Knowledge**: Theoretical understanding [Level 9]

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	3	0	A1,A3,D4	**General Introduction:** Security Attacks, Services, Mechanisms	Lecture	-
2	3	0	A1,A3, B1, C1,D2	**Overview of symmetric ciphers:** Traditional, DES, and AES	Lecture, Group Discussion	-
3	3	0	A1,A3, B1, C1,D2	**Overview of asymmetric ciphers:** Public-Key Cryptosystems and RSA	Lecture, Group Discussion	-
4	3	0	A1,A3,C1, D4	**Block Cipher Operation:** ECB, CFM, OFM, CM, and XTS-AES Mode	Lecture	-
5	3	0	A1,A3,C1, D4	**Cryptographic data integrity:** Hash Function, MAC, Digital Signatures	Lecture	**Assignment 1**
6	3	0	A1,B1,B2, B3,D1,D2	**Tutorial Session:** Problem Solving and Software Demonstration	Group Discussion	-
7	3	0	A1,A3,B1, C1,D1,D4	**Mutual Trust:** Key Management and User Authentication	Lecture	**Test1** A1, B1, C1
8	3	0	A1,A2,A3, C1,D4	**Network and Internet Security:** Network Access Control, Cloud Security Risks and Countermeasures, Cloud security as a Service	Lecture	-
9	3	0	A1,A2,A3, C1,D4	**Network and Internet Security:** Web Security Consideration, Secure Sockets Layer, Transport Layer Security, HTTPS, SSH	Lecture	-
10	3	0	A1,B1,B2, B3,D1,D2	**Tutorial Session:** Problem Solving and Software Demonstration	Group Discussion	-

11	3	0	A1,A2,A3,B1,C1,D4	**Network and Internet Security:** Wireless Security, Mobile Device Security, IEEE 802.11i	Lecture, Group Discussion	-
12	3	0	A1,A2,A3,B1,C1,D4	**Network and Internet Security:** Pretty Good Privacy, S/MIME, Domain Keys Identified Mail	Lecture, Group Discussion	-
13	3	0	A1,A2,A3,B1,C1,D4	**Network and Internet Security:** IP Security overview and Policy, Encapsulating Security Payload, Combining Security Associations	Lecture, Group Discussion	**Test 2** A1, B1, C1
14, 15	3	0	A2,A3,D1,D2, D4	**Research Assignment Presentation**	Group Discussion	**Research assignment** A2,A3,D1,D2, D4
16			A1,B1,C1,C2	**Final Examinations**		**Written Exam** A1,B1,C1,C2

TEACHING MATERIALS:

TEXTBOOK(S):	William Stalling & Laurie Brown 'Computer Security Principles and Practices' , 4rd Edition, Pearson, 2018
HANDOUT(S):	Material provided in eLearning (Moodle)
REFERENCE(S):	Texts: . Stallings, "Cryptography and Network Security: Principles & Practice", 8th edition, Pearson, 2019. Behrouz A. Forouzan 'Cryptography and Network Security' McGraw-Hill International Edition, 2008. Articles/Research papers: 1. Ammar Aldallal, "Exploring DOM-Based Cross-Site Scripting", International Conference on Recent Advancess in Engineering and Technology (ICRAET), Berlin, Germany, 3-4 Oct. 2017, pp.1-4. 2. Ammar Aldallal and Kashif Shabbir, "Protecting Web Applications from Cross-Site Scripting Attacks", Journal of Applied Engineering Research, volume 2017, issue 3, July – August, pp.1-21 3. Zargar, S., Joshi, J., and Tipper, D.; "A Survey of Defense Mechanisms Against Distributed Denial of Service (DDoS) Flooding Attacks", Communications Surveys & Tutorials, IEEE, Volume: PP , Issue: 99, pp. 1 - 24, 2013. 4. M. A. Ambusaidi, X. He, P. Nanda and Z. Tan, "Building an Intrusion Detection System Using a Filter-Based Feature Selection Algorithm," in IEEE Transactions on Computers, vol. 65, no. 10, pp. 2986-2998, 1 Oct. 2016. 5. Larry Greenemeier, 'Fact or Fiction: Encryption Prevents Digital Eavesdropping' , Scientific Americain,July 15, 2013

	http://www.scientificamerican.com/article.cfm?id=fact-fiction-encryption-prevents-digital-eavesdropping
	6. G. Richard Newell and Tim Morin, 'The Right and Wrong Way to Implement Cryptographic Algorithms in Embedded Electronic Systems' , EDN Network, March 2013, http://www.edn.com/design/systems-design/4410267

Assessment:

Method of Assessment	Description	Learning Outcomes	Weighting
Test (2)	Two tests of one hour each covering topics discussed in class up to week (6) & week (12). First test is worth 20% and the second 15%.	A1, B1, C1	35%
Programming Project (Assignment 1)	The first project is individual where each student has to implement/apply a security system from those discussed in the class.	A1, A2, B1,B2, B3, D1	10%
Research Assignment	The second project is a group project where each group has to write a research project about one of the security topics covered in class Students may use the articles from the reference list as references for their project)	A2,A3,D1, D2,D4	15%
Final Exam:	A two-hour final exam consisting of problem solving and essay questions. The exam covers all the topics in the course syllabus.	A1, B1, C1, C2	40%
Exercises	Selective practice questions from the textbook	B1	*Formative Assessment
Oral Participation	Questions and discussion during the lecture	A1, D1	*Formative Assessment
Overall:			**100%**

Admissions	
Pre-requisites	None
Minimum number of students	**5**
Maximum number of students	**20**

COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER

<u>**COURSE SYLLABUS/ SPECIFICATION**</u>

Course Code & Title: ECCE 507- Modeling & Simulation

Weight: 3-0-3

Prerequisite: None

NQF Level Allocated: 9   **NQF Notional Hours / Credits:** 120/12

Description: The purpose of this course is to introduce the fundamental concepts in the general area of modeling and simulation. Topics include principles of modeling and simulation, basics of discrete-event simulation, simulation software, mathematical and statistical models, queuing models, simulation design, modelling of simulation data, and output statistics. Concepts are illustrated with examples of simulation of computer systems and networks.

Objective:

1. To overview concepts and principles of modeling and simulation and survey current simulation software.
2. To discuss Simulations methodologies such as Discrete-Event simulation and statistical modeling of physical systems.
3. To explore system modeling using queuing theory approach and its use in modeling computer systems and networks.
4. To effectively use simulation packages to model and simulate computer systems and networks.

Semester:

Instructor (s):

Office Telephone: 17298999   Ext.: 8674   **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding	NQF Descriptor/ Level
A1. Concepts and Theories: Demonstrate understanding of concepts and theories of systems modeling and simulation including embedded theory drawing on probability and statistics.	Knowledge: theoretical understanding [Level 9]
A2. Contemporary Trends, Problems and Research: Understand the evolution of modeling and simulation schemes in applied to IT and Computer Science.	Knowledge: theoretical understanding [Level 9]
A3. Professional Responsibility: Demonstrate knowledge and understanding of professional responsibility and accountability areas related to the use of modeling and simulation in IT and Engineering, such as the use of incomplete models or the use of models beyond their scope or applicability.	Knowledge: theoretical understanding [Level 9]

B. Subject-Specific Skills	NQF Level
B1. Problem Solving: demonstrate professional level of insight and originality in identifying appropriate models for solving simulation problems in areas of IT and computer science.	Knowledge: theoretical Understanding [Level 9] Generic problem solving and analytical skills [Level 9]
B2. Modeling and Design: Design and run simulation models applicable to a variety of contexts (e.g. discrete events).	Knowledge: Practical application [Level 9] Competence : Context[level 8]
B3. Application of Methods and Tools: Apply specific simulation schemes and use appropriate simulation packages such as Simulink to solve problems at hand.	Knowledge: Practical application [Level 9] Skills: Communication, ICT and Numeracy [Level 9]

C. Critical Thinking Skills	NQF Level
C1. Analytic: Critically evaluate and test employed models/simulation methods and evaluate the results of output.	Generic problem solving and analytical skills [Level 9] Skills: Communication, ICT and Numeracy [Level 9] Knowledge: Practical Application [Level 9]
C2. Synthetic: Integrate results generated from a variety of simulation designs to mimic computer systems/ networks.	Generic problem solving and analytical skills [Level 9] Knowledge: Practical Application [Level 9]
C3. Creative: Inject creativity into model formulation and simulation design.	Generic problem solving and analytical skills [Level 9] Knowledge: Practical Application [Level 9]

D. General and Transferable Skills	NQF Level
D1. Communication: Present solutions to modeling and simulation problems and express ideas cogently and effectively in written and oral forms.	Communication, ICT and Numeracy Skills [Level 9]
D2. Teamwork and Leadership: Work effectively as a member of a project team and demonstrate understanding of individual responsibility within the team.	Competence: Autonomy, Responsibility and Context [Level 8]
D3. Organizational and Developmental Skills: demonstrate professional skills in planning, managing , and allocating time effectively in assigned tasks such as group projects and assignments.	Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3	A1, A2, A3	Introduction to modeling and simulation	Lecture	-
2	3	A1, A2, A3, D1	Simulation Examples - General Principles in Simulation	Lecture Discussion	Oral Enquiry*(A1,D1)
3	3	A1, A2,A3, D1	Modeling :concepts and principles Overview of Simulation Software	Lecture Discussion	Oral Enquiry*(A1,D1) Assignment 1 (A1,A2,A3,D1)
4	3	A1,A2,A3,D1	Discrete-event simulation (DES)	Lecture Discussion	Oral Enquiry*(A1,A2,D1)
5	3	A1, B1,B2, B3,C1,D1	DES : Modeling and simulation with Simulink	Lecture, Lab demo/ supervised individual lab work	Oral Enquiry*(A1,D1) Assignment 2 (B1,B2,B3,D1)
6	3	A1,B1, D1	Review on Probability Theory and Statistics	Lecture Tutorial	Oral Enquiry*(A1,D1) In-class Exercises*(A1,B1)
7	3	A1,B1,C, D1	Statistical models in Simulation Assignment of Team Project	Lecture Tutorial Discussion	Oral Enquiry*(A1,D1) In-class Exercises* (A1,B1,C1)
8	3	A1,B1, B2,C1,D1	Random Number Generator	Lecture Tutorial	Oral Enquiry*(A1,D1) In-class Exercises*(A1,B1) Assignment 3 (B1,B2,C1,D1)
9	3	A1,B1,B2,C1,C2,D1	Output Analysis	Lecture tutorial	Oral Enquiry*(A1,D1) Midterm Exam (A1,B1,B2,C1,C2, D1)

10 & 11	6	A1, A2,B,B2, B3,C1,C3, D1	Queuing Theory and Models	Lectures Tutorial	Oral Enquiry*(A1,D1) In-class Exercises*(A1,B1,C1) Assignment 4 (A1,B1,B2,B3,C1,C3,D1)
12	3	B1, B2, B3,C1,C2,D1	Modeling Queuing systems with Simulink	Lecture, supervised individual lab work	Oral Enquiry*(B1,D1)
13	3	A1, B1, B2, B3,C1,C2,C3,D1	Modeling and Simulation of Computer Systems . Simulink application.	Lecture, supervised individual lab work	Oral Enquiry*(A1,B1,D1)
14	3	A1, B1, B2,B3,C1,C2,C3,D1	Modeling and Simulation of Computer Networks. Simulink application.	Lecture, supervised individual lab work	Oral Enquiry*(A1,B1,D1)
15	3	A1, A2, B1, B2, B3,C1, C2,C3,D1,D2,D3	Project Presentation by Students		Project Evaluation (A1,A2,B1,B2,B3,C1,C2,C3,D1,D2, D3)
16	2				Final Exam (A1,B1,B2,C1,C2, D1)

* Formative assessment

Teaching Materials:

Textbook(s):	Byoung Kyu Choi, DongHun Kang, Modeling and Simulation of Discrete Event Systems, 1st edition, Wiley, 2013.
Handout(s):	Lecture slides and notes Other resources are available on the Course website (Moodle system)
Reference(s):	Byoung Kyu Choi, DongHun Kang, Modeling and Simulation of Discrete Event Systems, 1st edition, Wiley, 2013. Lecture slides and notes Other resources are available on the Course website (Moodle system) **Reference Texts/Papers/Journals:** 1. Jerry Banks et al, Discrete-Event System Simulation , 5th Edition, Prentice Hall, 2010. 2. Frank L. Severence, System Modeling and Simulation, Wiley India Pvt. Limited, 2009 3. Adil Adil Nazir Malik, Modeling and Simulation of computer Networks Using OPNET , LAP LAMBERT Academic Publishing, December 2012

	4. Harold Klee , Randal Allen , Simulation of Dynamic Systems with MATLAB and Simulink, CRC Press, 2nd Edition, February 2011
	5. An Overview of the OMNeT++ Simulation Environment,Andras Varga 7 Rudolph Hornig, SIMUTools, March 03 – 07, 2008, Marseille, France.
	6. Simulation Modeling Practice and Theory ,International Journal of the Federation of European Simulation Societies - EUROSIM
	7. International Journal of Modeling and Simulation, ACTA Press
	8. Journal of Modeling and Simulation in Engineering, Hindawi Publishing Corporation
	9. World Journal of Modelling and Simulation, World Academic Press, World Academic Union , England , UK
	10. Journal of Modelling and Simulation of Systems (JMSS), HyperSciences Publisher
	Journal of Simulation Modelling Practice and Theory, Elsevier

Assessment

Type of Assessment[1]	Description[2]	ILOs[3]	Weighting
Assignment 1	*Four assignments are assigned throughout the course.* *Assignment 1: A research assignment is assigned in the 3rd week of the course. Students are requested to read selected literature on modeling and simulation and discusse the reasons behind simulating real world systems and analyze the different types of simulation currently in use in the area of IT and computer science , then draw a conclusion of the most appropriate schemes to apply to computer and networks systems. The students are expected to submit a four-page report within three weeks. Selected literature is made available on the course website at the beginning of the course.* *Assignment 2: students use DES and computer software (SIMULINK) to model and simulate a variety of simple systems.*	A1,A2,A3,D1	10% each
Assignment 2	*Assignment3: students solve a set of exercises using statistical modeling of specific systems.* *Assignment4: students are asked to model specific computer/network systems using queuing*	B1,B2,B3,D1	Average 20 %
Assignment 3		B1,B2, C1,D1	

Assignment 4	*theory/data structures and proceed with a computer implementation of the simulation .* *Assignments are to be handed in electronically or uploaded on the Moodle system on the due date. Plagiarized work will be penalized.*	A1,B1,B2,B3,C1,C3,D1	
Midterm Exam	*The test is open book , open notes, is of one hour and 30 min duration, and consists of short essay questions and problem solving-based short answer questions (SAQs)*	A1,B1,B2,C1,C2, D1	20 %
Team Project	*A project is assigned in week 7 of the course and consists of a comprehensive computer simulation of a computer/network system (e.g.: wireless networks) followed by an output analysis of the simulation results in order to assess the effectiveness of the implemented simulation scheme. Students are required to work in teams of at least two members.* *In the final week, each student is required to make a presentation of his/her project contribution. Projects are evaluated according to a university-approved marking rubric.*	A1,A2,A3,B1,B2,B3,C1,C2,C3,D1,D2,D3	20%
Final Examination	*The final exam is open book, open notes , of two and a half hours duration and consists of Multiple Choice Questions (MCQs), short essay questions, and problem solving-based short answer questions (SAQs).*	A1,B1,B2,C1,C2, D1	40 %
Oral Enquiry	*Questions are asked continuously to assess student understanding in the different topics covered in class.*	A1,A2,A3,D1	Formative Assessment
In-class exercises	*Supervised problem solving or lab exercises with instructor's feedback*	A1,B1,C1	Formative Assessment
		Overall:	**100%**

13. Admissions	
Pre-requisites	No Pre-requisite course, but knowledge of probability and statistics may be required
Minimum number of students	4
Maximum number of students	20

COLLEGE OF ENGINEERING
DEPARTMENT OF TELECOMMUNICATION ENGINEERING

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 531 Advanced Networking

Weight: (3-0-3)

Prerequisite: None

NQF Level Allocated: 9   **NQF Notional Hours / Credits:**   120

Description: This course gives an overview of the networking in general and concentrates on the purposes and protocols involved in the upper IP reference model layers. It covers in details the following layers: Network, Transport and Application.

Objective:

1. To provide students with the general concepts of data networking,
2. To explore in detail various techniques related to the lower layers.
3. To discuss the upper layers protocols and their associated techniques in detail.

Semester:

Instructor (s):

Office Telephone: 17298 999

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate knowledge and understanding of concepts and theories related to data networking and associated layers.	Knowledge: theoretical understanding **[Level 9]**
A2	**Contemporary Trends, Problems and Research:** Demonstrate an informed and critical awareness of internetworking problems, research issues and technological advancements.	Knowledge: theoretical understanding **[Level 9]**
A3	**Professional Responsibility:** Demonstrate cognizance of and adhere to the professional and legal standards as a	Knowledge: theoretical understanding **[Level 9]**

	network user/consumer.	

	B. Subject-specific Skills	**NQF Descriptor/ Level**
B1	**Problem Solving:** Identify internetworking problems; plan, design, and implement appropriate solutions related to the following concepts: error detection/ correction, flow control and multiple access, IP distribution and management, transport layer protocols and traffic management.	Knowledge: theoretical understanding **[Level 9]** Communication, ICT and Numeracy Skills **[Level 9]** Generic problem solving and analytical skills **[Level 9]**
B2	**Modeling and Design:** Model and design internetworking protocol/ component in order to illustrate one or combination of the following concepts: reliable and unreliable communication, connectionless and connection-oriented communication, hop-to-hop, host-to-host, and process-to-process deliveries.	Knowledge: theoretical understanding **[Level 9]** Knowledge: practical application **[Level 9]**
B3	**Application of Methods and Tools:** Use effectively one of the available simulation software (MATLAB, OPNET, or Cisco Packet Tracer) to implement various techniques relevant to internetworking in order to illustrate one or combination of lower/upper layers protocols.	Knowledge: practical application **[Level 9]** Communication, ICT and Numeracy Skills **[Level 9]**

	C. Critical-Thinking Skills	**NQF Descriptor/ Level**
C1	**Analytic skills:** Evaluate internetworking protocols within lower/upper layers considering identification of the corresponding benefits and challenges for each implementation.	Generic problem solving and analytical skills **[Level 9]** Communication, ICT and Numeracy Skills **[Level 9]**
C2	**Synthetic:** Link internetworking lower/upper layers through appropriate protocols in order to provide end-to-end communication corresponding to the desired application demands and user expectation.	Knowledge: theoretical understanding **[Level 9]** Generic problem solving and analytical skills **[Level 9]**
C3	**Creative Thinking and innovation:**	

	D. General and Transferable Skills (other skills relevant to employability and personal development)	**NQF Descriptor/ Level**
D1	**Communication:** Express and communicate ideas cogently, persuasively and effectively, in written and oral form, to a diverse range of audiences and stakeholders through written test, final examination, group assignment, and research project.	Communication, ICT and Numeracy Skills **[Level 9]**
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a team of technical people who may plan, design, implement, manage, monitor and evaluate an enterprise network/system.	Competence: Autonomy, Responsibility and Context **[Level 9]**
D3	**Organizational and Developmental Skills:**	

D4	Ethics and Social Responsibility:	

Course Structure (Outline)

Week	Hours	ILOs	Topics	Teaching Method	Assessment Method
1	3	A1,A3	**Introduction:** General concepts	Lecture	-
2	3	A2,A3,C2,D2	**Network Thinking and Social Networks**	Lecture, Group Discussion	-
3	3	A1,B3,C1,C2	**Physical Layer:** Overview	Lecture	-
4	3	A1,B1, B3,C1,D2	**Data Link Layer:** Error detection and correction	Lecture, Group Discussion	-
5	3	B1, B3,C1,D2	**Data Link Layer:** DLC and MAC	Lecture, Group Discussion	-
6	3	A1,C1,C2	**Data Link Layer:** Wired and Wireless LANs	Lecture	-
7	3	A2,A3,C2,D1,D2	Research Project Presentation	Group Discussion	**Test1**
8	3	A1, B1,C1,C2,D1	**Network Layer:** Protocols	Lecture	
9	3	A1,B3,C1,D2	**Network Layer:** Unicast and Multicast Routing	Lecture	-
10	3	A1,B3,C1,D2	**Network Layer:** Next Generation IP	Lecture, Group Discussion	-
11	3	A1,C1,C2,D2	**Transport Layer:** Introduction	Lecture, Group Discussion	**Research Project (part1)**
12	3	A1,B3,C1,D2	**Transport Layer:** UDP, TCP, SCTP	Lecture, Group Discussion	**Research Project (part2)**
13	3	A1,A3,D2	**Network Management**	Lecture, Group Discussion	**Research Project (part3)**
14	3	A3,B2,,D1,D2	**Group Assignment Presentation**	Group Discussion	**Test 2**
15	3	A1,B1,C1,D1	Final Revision	Lecture, Group Discussion	-
16	2	A1,B1,C1,D1	Final Examinations		Written Exam

* Formative assessment

Teaching Materials:

Textbook(s):	1. Nader F. Mir, "Computer and Communication Networks", Pearson Education, Inc., 2015

Handout(s):	Notes will be provided on Moodle.
Reference(s):	**Books:** 1. B. A. Forouzan, "Data Communications and Networking", 5^h edition, McGraw-Hill educations, 2013. **Articles:** 1. Liu, J. ; Yang, O.; "Using Fuzzy Logic Control to Provide Intelligent Traffic Management Service for High-Speed Networks", IEEE Transactions on Network and Service Management, Issue 99, pp.1 – 14, May 2013. 2. Jianhua Han; Jikui Wen ; Zhao, Xiaojun; "A study on academic performance and interpersonal interactions based on network", 14th International Conference on Computer Supported Cooperative Work in Design (CSCWD 2010), pp. 647 – 652, 14-16 April 2010. 3. Zhijun Rong; Peigen Li ; Xinyu Shao ; Kuisheng Chen; "Social aspects of collaborative design", 12th International Conference on Computer Supported Cooperative Work in Design (CSCWD 2008), pp. 241 – 245, 16-18 April 2008.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Test 1	"One hour Test covering topics discussed in the first 7 weeks".	A1,B1,D1	**20%**
Research Project: **Oral Presentation:** **Report:**	"Each student has to select a topic from the specified networking areas, and present a research proposal."	A2,A3,C2,D1	**5%** **15%**
Test 2	"One hour Test covering topics discussed in the weeks 8 to 14".	A1,B1,D1	**20%**
Final Exam:	"Two hour Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus".	A1,B1,C1, D1	**40%**
Overall:			**100 %**

Admissions	
Pre-requisites	None
Minimum number of students	**4**
Maximum number of students	**25**

COLLEGE OF ENGINEERING
DEPARTMENT OF TELECOMMUNICATION ENGINEERING
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ECTE 535: Broadband & Wireless Networks
Weight: (3 – 0 – 3)
Prerequisite: None
NQF Level Allocated: 9   **NQF Notional Hours / Credits:** 120/12

Description: This course first discusses various concepts involved in multimedia networks including multimedia components presentation, switching techniques, delay analysis, queuing theory, traffic congestion, and QoS. The second part of the course gives an overview of broadband networks including: Telephony Networks, Enterprise Networks, and Mobile ad-hoc networks.

Objective:
1. To explain broadband and wireless networks concepts, techniques and systems.
2. To teach students how to apply the fundamentals of broadband and wireless network with a focus on the design and performance evaluation of cellular wireless networks, Enterprise Networks, and Mobile ad-hoc networks.
3. To explain and demonstrate the effective use of advanced networks concepts such as delay analysis, queuing theory, traffic congestion, and QoS.

Semester: Second 2019 – 2020
Instructor (s): Dr. Ahmed J. Jameel
Office Telephone: 17298999 – 8654   **Email (s):** adulaimi@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding	NQF Level
A1. <u>Concepts and Theories:</u> *Demonstrate extensive knowledge and critical understanding of key concepts and theories related to Switching, Delay analysis, Queuing Theory, Traffic Congestion, and QoS.*	Knowledge: theoretical understanding [Level 9]
A2. <u>Contemporary Trends, Problems and Research:</u> *Demonstrate an informed and critical awareness of the current trends and advancements of broadband networking problems, research issues and technological advancements.*	Knowledge: theoretical understanding [Level 9]
A3. Professional Responsibility: N/A	

B. Subject-Specific Skills	NQF Level
B1. <u>Problem Solving:</u> *Identify appropriate coding approach, switching technology, queuing scheme, type and amount of resources to be allocated, and desired QoS level for the discussed cases.*	Knowledge: theoretical understanding [Level 9] Generic problem solving and analytical skills [Level 9] Communication, ICT and Numeracy Skills [Level 9]
B2. <u>Modeling and Design:</u> *Model and design communication network/ component that is appropriate to be used for transferring multimedia applications in order to illustrate one or combination of the following concepts: coding approach, switching technology, and queuing scheme.*	Knowledge: theoretical understanding [Level 9] Knowledge: practical Application [Level 9]

B3. Application of Methods and Tools: *Use effectively one of the available simulation software (MATLAB, OPNET, or Cisco Packet Tracer) to illustrate various methods and tools related to: multimedia coding/compression, switching techniques, queuing theory, traffic congestion, and QoS.*	Knowledge: theoretical understanding [Level 9] Knowledge: practical Application [Level 9]

C. Critical Thinking Skills	**NQF Level**
C1. Analytic: *Evaluate discussed communication network/component and express benefits and challenges of the involved coding/compression approach, switching technology, and queuing scheme.*	Generic problem solving and analytical skills [Level 9] Communication, ICT and Numeracy Skills [Level 9]

D. General and Transferable Skills	**NQF Level**
D1. Communication: *Express and communicate ideas cogently, persuasively and effectively, in written and oral form, to a diverse range of audiences and stakeholders through written test, final examination, group assignment, and research project.*	Communication, ICT and Numeracy Skills [Level 9]
D2. Teamwork and Leadership: *Work effectively as a member/leader of a team of technical people who may plan, design, implement, manage, monitor and evaluate a communication network/component.*	Competence: Autonomy, Responsibility and Context [Level 9]

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	3	0	A1	**Introduction:** General concepts	Lecture	-
2	3	0	A1, B1, C1	**Multimedia:** Representation & Compression	Lecture	-
3	3	0	A2, B1, B3, C1	**Multimedia:** Representation & Compression	Lecture	-
4	3	0	A1, B1, B3, C1	**Switching:** Circuit & Packet Switching	Lecture	-
5	3	0	A1, B1, B3, C1	**Advanced Concepts:** Delay Analysis and Queuing Theory	Lecture	-
6	3	0	A1, A2, B1, C1	**Advanced Concepts:** Traffic Congestion and QoS	Lecture	-
7	3	0	B1, B2, B3, D2	**Tutorial Session:** Solving and Discussing Problems related to the topics covered in the first 6 weeks	Tutorial, Group Discussion	-
8	3	0	B2, B3, C1, D1, D2	**Group Project Presentation**	Group Discussion	**Group Project Evaluation** (B2, B3, C1, D1, D2)
9	3	0	A1, B1, B3, C1, D1	**Telephony Networks:** PSTN and Cellular	Lecture	**Test** (A1, B1, D1)
10	3	0	A2, B3, C1, D2	**Telephony Networks:** PSTN and Cellular **Enterprise Networks**	Lecture, Group Discussion	-
11	3	0	A2, B3, C1, D2	**Enterprise Networks**	Lecture, Group Discussion	-
12	3	0	A1, A2, C1, D2	**ATM and Optical Networks**	Lecture, Group Discussion	-

13	3	0	A1, A2, C1, D2	**Mobile Ad-Hoc and Wireless Sensor Networks**	Lecture, Group Discussion	-
14	3	0	B1, B3, C1, D2	**Tutorial Session:** Solving and Discussing Problems related to the topics covered in the last 4 weeks	Tutorial, Group Discussion	-
15	3	0	A2, C1, D1, D2	**Research Assignment Presentation**	Group Discussion	**Research Assignment Evaluation** (A2, C1, D1)
16	2	-				**Final Exam** (A1, B1, C1, D1)

Teaching Materials:

Textbook(s):	1. C. Beard and W. Stallings, "Wireless Communication Networks and Systems", 1st Edition, Pearson, 2016. 2. Nader F. Mir, "Computer and Communication Networks", Pearson Education, Inc., 2015. 3. W. Stallings, "Data and Computer Communications", 9th edition, Pearson, 2011. 4. B. A. Forouzan, "Data Communications and Networking", 5th edition, McGraw-Hill educations, 2013. 5. Chang Wen Chen, Zhu Li, and Shiguo Lian, "Intelligent Multimedia Communication: Techniques and Applications", Springer, 2010.
Handout(s):	• Lecture Notes, Handouts: available on Moodle.
Reference(s):	1. M. Sundarambal, M. Dhivya, and P. Anbalagan; "Performance evaluation of bandwidth allocation in ATM networks", International Journal of Business Information Systems, Volume 6, Number 3, pp. 398-417, 2010. 2. Alex Kesselman, Kirill Kogan, and Michael Segal; "Packet mode and QoS algorithms for buffered crossbar switches with FIFO queuing", Distributed Computing, Volume 23, Issue 3, pp 163-175, November 2010.

Assessment

Type of Assessment[1]	Description[2]	ILOs[3]	Weighting
Test	"One-hour Test covering topics discussed in the first 6 weeks".	A1, B1, D1	20%
Research Assignment: Oral Presentation: Report:	"Each student has to do a literature review about one of the specified communication networks and summarize, present, and discuss his/her research in the class."	A2, C1, D1, D2	5% 10%
Group Project: Oral Presentation: Team Work: Report:	"The class will be divided into groups, each group has to select a technique related to: compression, switching, or queuing; and present the following: Concept, Implementation, Advantages, and Disadvantages."	B2, B3, C1, D1, D2	5% 5% 15%
Final Exam:	"Two-hour Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus".	A1, B1, C1, D1	40%
		Overall:	**100%**

\[1] *For approved types of assessment (e.g. quiz, exam, project, etc.) see the ILO-Assessment Matrix in page 9 of Assessment Manual Version 2.0*

[2] As *a minimum provide the description should provide details of type of tasks to be completed and duration (if appropriate)*

[3] *The learning outcomes should be taken from the weekly schedule. Ensure that the assessment type and the learning outcomes are aligned as per the ILO-Assessment Matrix in page 9 of Assessment Manual Version 2.0*

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COLLEGE OF ENGINEERING
DEPARTMENT OF TELECOMMUNICATION ENGINEERING
COURSE SYLLABUS/ SPECIFICATION

Course Code and title	**ECTE 537: Network Security**
Weight:	**(3 - 0 - 3)**
Prerequisite:	**None**
NQF Level Allocated	**9** **NQF Notional Hours / Credits: 120/12**
Description:	This course covers advanced topics in IT security spanning Network security including: Security at the Application Layer, Security at the Transport Layer, Security at the Network Layer, and general aspects in Mobile ad-hoc networks security.
Objectives:	1. To provide student with an overview of modern symmetric and asymmetric cryptosystems. 2. To explore advanced techniques in cryptographic data integrity and mutual trust. 3. To discuss various approaches in network and internet security in detail

SEMESTER:	Second	**ACADEMIC YEAR:**	2019-2020
INSTRUCTOR:	Dr. Ammar Sami Al-Dallal		
OFFICE TEL.:	17298999 Ext. 8914		
EMAIL:	aaldallal@ahlia.edu.bh		

Intended Learning Outcomes (ILOs)

A.	Knowledge and Understanding	NQF Descriptor/ Level
A1	Concepts and Theories: Demonstrate knowledge and understanding of concepts and theories related to network security, encipherment, and mutual trust.	**Knowledge**: Theoretical understanding [Level 9]
A2	Contemporary Trends, Problems and Research: Demonstrate an informed and critical awareness of network security problems, research issues and technological advancements.	**Knowledge**: Theoretical Understanding [Level 9]
A3	Professional Responsibility: Demonstrate cognizance of and adhere to the professional and legal standards as a network user/consumer.	**Knowledge:** Theoretical Understanding. [Level 9]

B.	Subject-Specific Skills	NQF Descriptor/ Level

B1	Problem Solving: Identify and evaluate network security problems; plan, design, and implement appropriate solutions related to encipherment, mutual trust, and corresponding implementation layer.	**Knowledge**: Practical application [Level 9]
B2	Modeling and Design: Model and design security system/component in order to illustrate one or combination of the following concepts: encipherment, data integrity, mutual trust, and internet security.	**Skills**: Generic problem solving & Analytical Skills [Level 9] **Knowledge**: Practical application [Level 9]
B3	Application of Methods and Tools: Use effectively one of the available simulation software (MATLAB, Sage, OPNET, or Cisco Packet Tracer) to implement various methods and tools related to encipherment, mutual trust, and network security such as AES, ECB, CFM, CBC, OFM, key distribution techniques, and user authentication.	**Skills**: Communication, ICT and Numeracy [Level 9]

C. Thinking Skills		**NQF Descriptor/ Level**
C1	Analytic: Evaluate the benefits, complexity, and challenges of the discussed methods and tools related to encipherment, mutual trust, and network security.	**Skills**: Generic problem solving & Analytical Skills [Level 9]
C2	**Synthetic**: *Identify* and integrate a range of security solutions to address computer security threats.	**Skills**: Generic problem solving & Analytical Skills [Level 9]

D. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)		**NQF Descriptor/ Level**
D1	Communication: Express and communicate ideas cogently, persuasively and effectively, in written and oral form, to a diverse range of audiences and stakeholders through written test, final examination, group assignment, and research project.	**Skills**: Communication, ICT and Numeracy [Level 9]
D2	Teamwork and Leadership: Work effectively as a member/leader of a team of technical people who may plan, design, implement, manage, monitor and evaluate a security system/protocol.	**Competence**: Autonomy, Responsibility and Context [Level 9]
D4	Ethical and Social Responsibility: Demonstrate awareness of, and adhere to, ethical and societal responsibilities in the area of network security.	Context [Level 9] **Knowledge**: Theoretical understanding [Level 9]

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	3	0	A1,A3,D4	**General Introduction:** Security Attacks, Services, Mechanisms	Lecture	-
2	3	0	A1,A3, B1, C1,D2	**Overview of symmetric ciphers:** Traditional, DES, and AES	Lecture, Group Discussion	Test1 (week 6)/ Exercise 1* Oral Participation*

3	3	0	A1,A3, B1, C1,D2	**Overview of asymmetric ciphers:** Public-Key Cryptosystems and RSA	Lecture, Group Discussion	Test1 (week 6) / Exercise2*
4	3	0	A1,A3,C1, D4	**Block Cipher Operation:** ECB, CFM, OFM, CM, and XTS-AES Mode	Lecture	Test1 (week 6) / Exercise 3*
5	3	0	A1,A3,C1, D4	**Cryptographic data integrity:** Hash Function, MAC, Digital Signatures	Lecture	Test1
6	3	0	A1,B1,B2, B3,D1,D2	**Tutorial Session:** Problem Solving and Software Demonstration	Tutorial/ software demo/Group Discussion	Test2 (week 12)/Quiz 2
7	3	0	A1,A3,B1, C1,D1,D4	**Mutual Trust:** Key Management and User Authentication	Lecture	Group project Oral Participation* / Test2 (week 12)
8	3	0	A1,A2,A3, C1,D4	**Network and Internet Security:** Network Access Control, Cloud Security Risks and Countermeasures, Cloud security as a Service	Lecture	Test2 (week 12) Exercise 4*
9	3	0	A1,A2,A3, C1,D4	**Network and Internet Security:** Web Security Consideration, Secure Sockets Layer, Transport Layer Security, HTTPS, SSH	Lecture	Test2 (week 12)/ Final Written Exam (week 16) Exercise 5*
10	3	0	A1,B1,B2, B3,D1,D2	**Tutorial Session:** Problem Solving and Software Demonstration	Tutorial/ software demo/Group Discussion	Test2/ Final Written Exam (week 16)
11	3	0	A1,A2,A3, B1,C1,D4	**Network and Internet Security:** Wireless Security, Mobile Device Security, IEEE 802.11i	Lecture, Group Discussion	Final Written Exam (week 16) Quiz 3
12	3	0	A1,A2,A3, B1,C1,D4	**Network and Internet Security:** Pretty Good Privacy, S/MIME, Domain Keys Identified Mail	Lecture, Group Discussion	Final Written Exam (week 16)
13	3	0	A1,A2,A3, B1,C1,D4	**Network and Internet Security:** IP Security overview and Policy, Encapsulating Security Payload	Lecture, Group Discussion	Final Written Exam (week 16)
14	3	0	A1,A2,A3, B1,C1,D4	**Network and Internet Security:** Combining Security Associations	Lecture, Group Discussion	Final Written Exam (week 16)
15	3	0	A1, A2, C1, D1,D2, D4	**Research Assignment Presentation**	Group Discussion	**Research assignment**
16	2					**Final Exam** A1,B1,C1

TEACHING MATERIALS:

TEXTBOOK(S):	W. Stallings, "Cryptography and Network Security: Principles & Practice", 7th edition, Pearson, 2017.
HANDOUT(S):	Material provided in eLearning (Moodle)

REFERENCE(S):	Books:

Books:

1. "Applied Cryptography and Network Security", 17th International Conference, ACNS 2019, Bogota, Colombia, June 5–7, 2019, Proceedings, Editors: Deng, R.H., Gauthier, V., Ochoa, M., Yung, M. (Eds.)
2. (ISC)2 CISSP Certified Information Systems Security Professional Official Study Guide 8th Edition, Kindle Edition, by Mike Chapple (Author), James Michael Stewart (Author), Darril Gibson (Author), 2018.
3.

Articles/Research papers:

4. Ammar Aldallal, "Exploring DOM-Based Cross-Site Scripting", International Conference on Recent Advances in Engineering and Technology (ICRAET), Berlin, Germany, 3-4 Oct. 2017, pp.1-4.
5. Ammar Aldallal and Kashif Shabbir, "Protecting Web Applications from Cross-Site Scripting Attacks", Journal of Applied Engineering Research, volume 2017, issue 3, July – August, pp.1-21
6. Zargar, S., Joshi, J., and Tipper, D.; "A Survey of Defense Mechanisms Against Distributed Denial of Service (DDoS) Flooding Attacks", Communications Surveys & Tutorials, IEEE, Volume: PP , Issue: 99, pp. 1 - 24, 2013.
7. M. A. Ambusaidi, X. He, P. Nanda and Z. Tan, "Building an Intrusion Detection System Using a Filter-Based Feature Selection Algorithm," in IEEE Transactions on Computers, vol. 65, no. 10, pp. 2986-2998, 1 Oct. 2016.

Assessment:

Type of Assessment		Description	Learning Outcomes	Weighting
Test		The test is one-hour Test covering topics discussed in first 7 weeks.	A1,B1,C1	25%
Research Assignment: Oral Presentation: Report:		"Each group of two students has to select a topic related to one of the specified network security to write a report, present, and discuss it in the class."	A1,A2,C1, D1,D2, D4	5% 15%
Best 3 of 4 assignments	**Group Assignment 1**	"The class will be divided into groups, each group has to implement/simulate specific symmetric cryptographic algorithm."	B2,B3,C2, D1,D2	15%
	Group Assignment 2	"The class will be divided into groups, each group has to implement/simulate specific asymmetric cryptographic algorithm."	B2,B3,D1,D2	
	Group Assignment 3	"The class will be divided into groups, each group has to implement/simulate hash function"	B2,C2,D1,D2	
	Group	"The class will be divided into groups,	B2,C2,D1,D2	

	Assignment 4	each group has to implement/simulate specific mutual trust / network access control."		
Final Exam:		"Two-hour Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus".	A1,B1,C1	40%
			Overall:	**100%**

Admissions	
Pre-requisites	None
Minimum number of students	**5**
Maximum number of students	**20**

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: **Artificial Intelligence**/ ITCS 509

Weight: **(3 - 0 - 3)**

Prerequisite: NONE

NQF Level Allocated: Level 9

NQF Notional Hours / Credits: 120 notional hours/ 12 NQF credit

Description: This course focuses on solving real world problems using techniques and methods of Artificial Intelligence (AI) from a computer science perspective and familiarizes students with the present and future of AI. This course is to cover two types of problem solving approaches: search-based and knowledge-based. The course is also to explore advanced AI techniques, such as ANN, EC, and fuzzy logic.

Objective:

1. To understand a range of specialized theories, principles and concepts of Artificial Intelligence.
2. To critically explore various intelligent algorithms and techniques for solving complex real world problems.
3. To apply a range of specialist models and knowledge representation methods in developing intelligent systems.
4. To research on new trends in Artificial Intelligence.

SEMESTER:

INSTRUCTOR:
OFFICE TEL:
EMAIL:

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** *Demonstrate knowledge and critical understanding of core concepts and theories in artificial intelligence.*	Knowledge: theoretical understanding [Level 9]
A2	***Contemporary Trends, Problems and Research:*** *Demonstrate critical awareness of the current problems, research issues and methods, technological advancements in field of artificial intelligence, such as machine learning, neural networks, expert systems.*	Knowledge: theoretical understanding [Level 9]
A3	***Professional Responsibility:*** N/A	

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** *Identify and solve problems using a range of specialized skills, techniques related to various artificial intelligence issues.*	Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical application [Level 9] Generic, Problem Solving and Analytical Skills [Level 9]
B2	**Modeling and Design:** Model, and design the components needed to implement intelligent systems such as expert systems, to meet desired needs within realistic constraints.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical application [Level 9]
B3	*Application of Methods and Tools:* Use and apply advanced techniques and tools (such as NLP, PROLOG, and A Network Language) to develop efficient artificially intelligent system.	Knowledge: Practical application [Level 9] Communication, ICT and Numeracy Skills [Level 9]

	C. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Critically evaluate and test employed AI techniques in given problems and test the performance of the resulting intelligent system.	Generic Problem Solving & Analytical skills [Level 9]
C2	*Synthetic: Integrate individual software components with other components such as a Neural Network classifier in order to create a larger AI system with more capabilities.*	Generic, Problem Solving and Analytical Skills [Level 9]
C3	*Creative Thinking and innovation:* N/A	

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Convey ideas and describe results rigorously using logic, theoretical models and formal languages, and present these in appropriate written and oral forms.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical application [Level 9]
D2	*Teamwork and Leadership: Work effectively as a member/leader of a team in order to complete a pre-defined research project.*	Competence: Autonomy, Responsibility and Context [Level 8]
D3	*Organizational and Developmental Skills:* N/A	
D4	*Ethics and Social Responsibility:* N/A	

Course Structure (Outline)

Course Structure (Outline)						
Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	3	-	A1	**Introduction and Intelligent Agents:** AI and Intelligent Agent concepts	Lecture/ Class Discussion	Major Exam (9th week) and Final Exam (Last Week)

2	3	-	A1, D1	**Problem Solving:** Problem definition and formulation, Problem Solving Agents.	Lecture/ Exercises	Major Exam (9th week) and Final Exam (Last Week)
3-5	9	-	A1,B1,B2,C1	**Search-based Problem solving:** Search Space Graph and Tree, Uniformed search strategies, Informed search strategies, Best first search: Greedy and A* search, optimization problems (Hill climbing search, Simulated annealing search, Genetic algorithms)	Lecture/ In-class Exercises/ Independent Learning	Exercises (B1,C1) /Research Assignment 1 (A1, B1, B2, C1)/ Major Exam (9th week) and Final Exam (Last Week)
6	3	-	A1 ,B2, B3, C1	**Knowledge-Based Problem Solving:** Concepts, Knowledge Representation: Propositional logic, First order logic (Syntax and semantic), Production rules, Semantic Network, Frames and objects.	Lecture/ Software Demo/	Major Exam (9th week) and Final Exam (Last Week)
7	3	-	A1, B2, C1	**Knowledge and Reasoning:** Inference Engines, Forward and Backward Chaining, Reasoning Patterns in propositional Logic.	Lecture/ In-class Exercises	Exercises (B2, C1)/ Major Exam (9th week) and Final Exam (Last Week)
8	3	-	A1,B1,B2	**Knowledge Based Systems:** Concepts and Development, Expert Systems.	Lecture/ Discussion	Major Exam (9th week) and Final Exam (Last Week)

9	3	-	A1,B1,B2, C1,C2	**Machine Learning:** Learning from observation, Forms of learning, Inductive learning, Learning decision trees	Lecture/ Discussion	Major Exam (9th week) and Final Exam (Last Week)
10-11	6	-	A2,B1, B2, B3,C1,C2	**Neural Network:** Concepts, Types of neural network architecture, forward and backward propagation algorithm.	Lecture/ Independent Learning/ In-class Exercises	Exercises (B2, C1)/ Final Exam (Last Week)
12	3	-	A2,B1, B2, B3,C1,C2,	**Natural Language Processing:** Steps in Processing Natural Language, Syntax, Examples of NLP applications.	Lecture/ Discussion	Final Exam (Last Week)
13	3	-	A2,B1,B2,C1,C2	**Evolutionary Computation:** Algorithms and applications	Lecture/ In-class Exercises/ Independent learning	Research Assignment 2(A2,B1, B2, C1, C2)/ Final Exam (Last Week)
14	3	-	A2, B1,B2	**Fuzzy Logic**	Lecture/ Discussion/ In-class Exercises	Final Exam (Last Week)
15	3	-	A1,A2,B1,B2,B3,C1,C2,D1, D2	Students team research projects (reports and presentations)	Student presentations of research projects	**Evaluation of Research Project Outcome & Presentation (**A1,A2,B1, B2,B3,C1,C2,D1, D2**)**
16	2					Final Exam (A1,A2,B1, B2,B3,C1,C2)

Teaching Materials:

Textbook(s):	1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 4th edition, 2020. **2.** Neapolitan, Richard E., and Xia Jiang. *Artificial Intelligence: With an Introduction to Machine Learning*. 2nd Ed., CRC Press, 2018.
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Goodfellow, Ian, et al. Deep learning. Vol. 1. Cambridge: MIT press, 2016. 2. Freedle R. Artificial intelligence and the future of testing. Psychology Press; 2014 Feb 24. 2018 3. Kevin P. Murphy, *Machine Learning: A Probabilistic Perspective*, The MIT Press, 2012. 4. Charniak, E., Riesbeck, C., McDermott, D., Meehan, J. Artificial Intelligence Programming. New York: Psychology Press. 2nd edition. 2014. 5. K.-L. Du and M. N. S. Swamy, *Neural Networks and Statistical Learning*, Springer, 2013. 6. Slade, Stephen. Artificial Intelligence Applications on Wall Street. Routledge, 2017. 7. C. M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2011. 8. Association for Advancement of Artificial Intelligence (AAAI) Website: http://www.aaai.org/home.html More references are available in the course website in Moodle.

Assessment

Type of Assessment[1]	Description[2]	ILOs[3]	Weighting
Research Assignment 1	The assignment consists of problem-solving based questions regarding topics in AI covered during the first 5 weeks. The purpose of the assignment is to assess students individually where they have to demonstrate their extensive and detailed knowledge and critical understanding of key concepts, theories, methods, tools and techniques of AI. The assignment will also assess students' skills to solve and analyze AI problems using advanced techniques, methods and tools. Soft copy submission is required by the end of the 6th week through the course page in Moodle where answers will be checked by Turnitin against	A1, B1, B2, C1	20%

	plagiarism. Best one out of the two research assignment will be considered.		
Research Assignment 2	Similar to assignment 1 but topics will cover the new trends and advanced techniques. Soft copy submission is required by the end of the 12th week through the course page in Moodle where answers will be checked by Turnitin against plagiarism. Best one out of the two research assignment will be considered.	A2,B1, B2, C1, C2	
Exercises	In-class exercises consist of problem solving and application of different tools. Each exercise will be one hour duration.	B1,B2,C1	Formative Assessment
Midterm Exam	The midterm exam will be an in-class 1-hour exam that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks.	A1,B1, B2, C1	20%
Team Research Project Report and Presentation	Starting from weak 4, the class will be divided into teams of 4-5 students and each will be asked to study a research problem in AI and machine learning utilizing the skills and tools learned in class. Teams are required to plan and execute the research project that may involve the application of advanced techniques and tools to develop efficient artificially intelligent system.In the final week, each team will have to submit their research report (worth 14%) explaining the research problem, research methods used, analysis and the conclusionhighlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation (worth 6%) summarizing the research conducted and its findings.Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.	A1,A2,B1, B2,B3,C1, C2,D1, D2	20%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions in AI and machine learning.	A1,A2,B1, B2,B3,C1, C2	40%
		Overall	100%

Admissions	
Pre-requisites	NONE
Minimum number of students	4
Maximum number of students	25

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COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 511–Advanced Database Systems

Weight: (3 - 0 - 3)

Prerequisite: None

NQF Level Allocated: 9

NQF Notional Hours / Credits: 120 notional hours/ 12 NQF credit

Description: This course explores databases as the underlying framework of information system which store, manipulate and retrieve data with particulars emphasis on the relational model and relational systems. Students are expected to design and implement a relational database within the concept of an information system using appropriate analysis and modeling techniques and a modern Database Management System as well as to understand RDBMS, advantages and disadvantages of different query languages and concurrency control and basic query processing.

Objective:

1. To provide a comprehensive overview of Database concepts, technologies and methodologies.
2. To critically plan, analyze, design, implement, and test database projects.
3. To construct advanced database query using SQL.
4. To critically understand and discuss selected advanced database topics.

Semester: 2

Instructor (s): Dr. Suresh Subramanian

Office Telephone: 17298974   **Email (s): ssubramanian@ahlia.edu.bh**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding	NQF Level
A1. Concepts and Theories: Demonstrate critical knowledge and understanding of relational database systems and concepts embedded in the storage, manipulation and retrieval of data.	Knowledge: theoretical understanding [Level 9]
A2. Contemporary Trends, Problems and Research: Demonstrate critical awareness of the current problems, research issues and methods, technological advancements in the field of database.	Knowledge: theoretical understanding [Level 9]

B. Subject-Specific Skills	NQF Level
B1. Problem Solving: Identify and solve complex problems using a range of specialized skills, techniques related to various database issues.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical application [Level 9] Generic, Problem Solving and Analytical Skills [Level 9]
B2. Modeling and Design: Develop database models for real-world problems and design their solutions using SQL language.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical application [Level 9]
B3. Application of Methods and Tools: Apply specialized methods and advanced tools to design and implement database systems including but not limited to SQL language, distributed database management systems, data mining, and data warehousing.	Knowledge: Practical application [Level 9] Communication, ICT and Numeracy Skills [Level 9]

C. Critical Thinking Skills	NQF Level
C1. Analytic: Critically analyze and evaluate different phases in database design, management and identify scope, objectives and characteristics in addition to identifying requirements for every step.	Generic, Problem Solving and Analytical Skills [Level 9]
C2. Synthetic: Develop and integrate components of database systems to deal with complex problems using ER model, schema, and DBMS languages.	Generic, Problem Solving and Analytical Skills [Level 9]
C3. Creative: Develop creative ideas to deal with complex problems in the advanced database applications and obtain efficient solutions.	Knowledge: Practical application [Level 9] Generic, Problem Solving and Analytical Skills [Level 9] Communication, ICT and Numeracy Skills [Level 9]

D. General and Transferable Skills	NQF Level
D1. Communication: Express ideas effectively, in written and oral form, to a diverse range of audience using appropriate techniques and tools.	Communication, ICT and Numeracy Skills [Level

				9] Knowledge: Practical application [Level 9]
	D2. Teamwork and Leadership: Work as a productive team member and cooperate with others in order to grasp the skills of a database manager leading a team.			Competence: Autonomy, Responsibility and Context [Level 8]
	D3. Organizational and Developmental Skills: Demonstrate ability to organize ideas and effectively allocate time in given assignment.			Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3	A1	Introduction and Database Concepts, Database System Concepts and Architecture	Lecture / class discussion	Oral Participation
2	3	A1, B2	Data Modeling, Entity-Relationship	Lecture	Oral Participation
3	3	A1,B2, C1,C2,D3	Relational Models, Relational Database Constraints	Lecture	Oral Participation
4	3	A1, B2,B3, C1,C2, D1, D3	Relational Database Constraints	Lab session & Software demo / supervised group lab work	Assignment 1 / Oral participation
5	3	A1, B2, C1	Relational Algebra	Lecture / In-class Exercises	In-class Exercises
6	3	A1, B1	SQL Language, Schema Definition	Lab session & Software demo/ supervised group lab work	In-Lab Exercises
7	3	B1,B3,C1	SQL Language queries	Lab session & Software demo /Lecture	In-Lab Exercises
8	3	B1,B2,B3 C1,C2	SQL Language queries	Lab session & Software demo / supervised lab work	Midterm Exam
9, 10	6	A1, B1,B2, B3, C1,C2	Query Processing	Lecture /	In-class Exercises/ Assignment 2

					In-class Exercises	
11	3	A1,B1,B2, C1, C2	Functional Dependencies and Normalization for Relational Databases	Lecture/ In-class Exercises	Oral Participation / In-class Exercises
12	3	A1, A2,B1	Distributed database management systems	Lecture/ class discussion	Oral Participation
13	3	A1, A2, C1,B1, B2	Object-Oriented Database concepts	Lecture/ class discussion	Oral Participation
14	3	A1, A2, B1, B2, C1	Data Warehouse	Lecture/ class discussion	Oral Participation/ In-class Exercises
15	3	A2, B1, B2,B3, C1, C2, C3, D1, D2, D3	Students Presentations and reports of Team Research Projects	Presentation of Projects by Students	Evaluation of Project Presentations & Reports
16	2				Final Exam

Teaching Materials:

Textbook(s):	**Elmasri R. and Navathe S., Fundamentals of Database Systems, 7th Edition, Pearson, 2015**
Handout(s):	**Instructor's power point slides**
Reference(s):	**1. Connolly T. and Begg C., Database Systems, A practical Approach to Design, Implementation, and Management, 6th Edition, Pearson, 2014.** **2. Carlos Coronel, Keeley Crockett, Steven Morris, and Peter Rob, Database Principles: Fundamentals of Design, Implementation, and Management, Cengage Learning ,2013.** **3. Avi, Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 7th Edition , McGraw-Hill, 2010** **4. David M. Kroenke, David J. Auer, Scott L. Vandenberg, and Robert C. Yoder, Database Concepts, 8th, Pearson, 2017.**

	5. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, Database Systems: The Complete Book, 2ed, Prentice Hall, 2009 6. More references are available in the course website in Moodle.

ASSESSMENT:

Type of Assessment	Description	ILOs	Weighting
Research Assignments	The assignments consist of essay, problem-solving and research based theoretical questions regarding topics in advanced database systems covered during the course. The purpose of the assignment is to assess students where they must demonstrate their extensive and detailed knowledge and critical understanding of database systems.	A2, B1, B2, C1, D1,D3	20%
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures and lab sessions.	A1, D1	3%
Midterm Exam	The midterm exam will be an in-class 1-hour exam that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks. Students will be asked to design and model some components of database.	A1,B1,B2,B3,C1,C2	20%
Team Project Report and Presentation	The class will be divided into teams of 2-5 students where each team will be asked to study a problem in advanced database systems utilizing the skills and tools learned in class. Teams are required to plan and execute the project that may involve the development and implementation of database models for real-world problems and their solutions, the application of Data Warehousing and OLAP techniques and/or the development and integrations of database systems components using ER model, schema, and DBMS languages. In the final week, each team will have to submit their research report explaining the research problem, research methods used, analysis and the conclusion highlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation summarizing the research conducted and its	A2, B1, B2,B3, C1, C2, C3, D1, D2, D3	17%

	findings. Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.			
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions including questions to develop parts of database systems to solve real-life problems.	A1, B1, B2,B3, C1, C2, C3		40%
			Overall	100%

Admissions	
Pre-requisites	None
Minimum number of students	**4**
Maximum number of students	**20**

Ahlia University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.ahlia.edu.bh/integrity **for more information).**

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF IT

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 514- Object Oriented Software Engineering

Weight: (3-0-3)

Prerequisite: None

NQF Level Allocated: 9

NQF Notional Hours / Credits: 120 notional hours/ 12 NQF credit

Description: This course focuses on object-oriented approach necessary to solve advanced and complex real-world problems. It is to understand a range of specialized theories, principles and concepts of object-orientation; object oriented software development process; the use of object-oriented design tools such as UML for modeling problem solutions. Topics include: Problem analysis and specification of software requirements; object-oriented design; reusability and design patterns; unit testing; advanced software development methodology such as Adaptive Object-Oriented Software Development.

Objective:

1. To critically explore various software development approaches and models.
2. To understand a range of specialized theories, principles and concepts of object-orientation, and their advantages.
3. To explain the development process of object oriented software.
4. To apply a range of specialist models and methods in developing software systems.
5. To research current trends in object oriented methodology and software engineering.

Semester: 1st 2019-2020

Instructor (s): Dr. Sohail Safdar

Office Telephone: EXT: 8698   **Email (s): ssafdar@ahlia.edu.bh**

Intended Learning Outcomes (ILOs):

	A. Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical understanding of a range of specialized theories, principles and concepts of software engineering and object oriented methodology.	Knowledge: theoretical understanding [Level 9]
A2	**Contemporary Trends, Problems and Research:** Demonstrate critical awareness of the current research, trends and advancements in software engineering and object oriented methodology.	Knowledge: theoretical understanding [Level 9]

	B. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Use a variety of advanced approaches to identify problems, elicit, analyze, formulate and specify requirements of stakeholders, design and model solutions.	Knowledge: Practical Application [Level 9] Skills: Communication, ICT & Numeracy [Level 9]
B2	**Modeling and Design:** Apply a range of specialist models to model different perspectives of software using UML, and to apply different approaches to design software architecture and components.	Knowledge: Practical Application [Level 9]
B3	**Application of Methods and Tools:** Apply appropriate advanced methods and tools to software development process.	Knowledge: Practical Application [Level 9] Skills: Communication, ICT & Numeracy [Level 9]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Conduct critical analysis of complex real world problems in order to identify possible solutions.	Generic Problem Solving & Analytical skills [Level 9]
C2	**Synthetic:** Critically review, and extend knowledge/skills/practices in software development to construct and reuse the multiple components of software/system.	Generic Problem Solving & Analytical skills [Level 9]
C3	**Creative:** Demonstrate creativity both in the application of knowledge and in the development of effective and efficient software applications to real world problems.	Generic Problem Solving & Analytical skills [Level 9]

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Develop an ability to effectively communicate with peers, and senior colleagues. Honing presentations skills in project report writing and oral presentation.	Communication, ICT and Numeracy Skills [Level 9]
D2	**Teamwork and Leadership:** Work effectively as a member of a study group, and where appropriate lead or take the initiative, to complete the group project/assignments according to deadlines.	Competence: Autonomy, Responsibility and Context [Level 9]
D3	**Organizational and Developmental Skills:** Learn to manage learning tasks independently and professionally with a view to inculcating skills for self-development and life-long learning in order to effectively prioritize, plan, manage and allocate appropriate resources to implement tasks in projects.	Competence: Autonomy, Responsibility and Context [Level 9]

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	3	-	A1	Course overview, software development process, software development approaches	Lecture/ Class Discussion	Major Exam (9th week) and Final Exam (Last Week)
2	3	-	A1	Principles of object orientation and its advantages, differences between an object-oriented approach and a procedural approach	Lecture/ Class Discussion	Major Exam (9th week) and Final Exam (Last Week)
3	3	-	A1, A2, D1, D3	Process models	Lecture/ Independent Learning	Major Exam (9th week) and Final Exam (Last Week)/ **Assignment1 (literature reviews)**
4	3	-	A1	Modeling Concepts, Introduction to UML	Lecture/ Class Discussion	Major Exam (9th week) and Final Exam (Last Week)
5	3	-	B1, C1	Object oriented software requirement analysis	Lecture/ In class exercises/ Case Studies	Project (week 15)/ Major Exam (9th week) and Final Exam (Last Week)
6	3	-	B1, B2, B3	Requirement specification and Use Case model	Lecture/ In class exercises/ Case Studies	**Exercises**/ Project (week 15)/ Major Exam (9th week) and Final Exam (Last Week)
7	3	-	B2, C1, C2	Software Architecture design	Lecture/ Case Studies	Major Exam (9th week) and Final Exam (Last Week)/ Project (week 15)

8-9	3	-	B2, C1, C2	Object oriented software design	Lecture/ Class Discussion	Project(week 15)/ **Major Exam** (9th week) and Final Exam (Last Week)
10-11	9	-	B2, B3, C2	Static and dynamic design modeling (Statechart model)	Lecture/ Case Studies/ In class exercises	**Exercises**/ Project (week 15)/ Major Exam (9th week) and Final Exam (Last Week)
12	3	-	A2, C2, B2, B3, D1, D3	Reusability and design patterns	Lecture/ Independent Learning	**Exercises**/Project (week 15)/ Final Exam (Last Week)
13	3	-	B3	Unit testing	Lecture/ tools demonstration	Project (week 15)/ Final Exam (Last Week)
14	3	-	A2, B2, D1, D3	Aspect-Oriented Software Development	Lecture/ Independent Learning	**Assignment2**/ Final Exam (Last Week)
15	3	-	A2, B1,B2, B3, C1, C2, C3, D1, D2, D3	Student Team Project Presentations	Regulations and Procedures for the project	**Student Project Presentation** (A2, B1,B2, B3, C1, C2, C3, D1, D2, D3**)**
16	2					**Final Exam (**A1,A2, B1,B2,B3, C1,C2)

* Formative assessment

Teaching Materials:

Textbook(s):	1. Alan Dennis, Barbara Haley Wixom, David Tegarden, systems analysis and design: an object oriented approach with uml, 5th Edition, John Wiley & Sons, 2016. ISBN: 1-118-80467-8, 978-1-118-80467-4, 1-119-03026-9, 9781119030263. 2. Additional: Bernd Bruegge, Allen H.Dutoit, object-oriented software engineering using UML, Patterns, and Java ,3rd edition,Pearson,2014
Handout(s):	Lecture Notes and Case Studies
Reference(s):	1. Ian Sommer Sommerville. *Software Engineering*, 9th Edition, Addison Wesley, 2010. 2. Simon Bennett, Steve McRobb and Ray Framer, *Object-Oriented System Analysis and Design using UML*, 4th Edition, McGraw Hill, 2011. 3. Kim Waldén and Jean-Marc Nerson, *Seamless Object-Oriented Software Architecture: Analysis and Design of Reliable Systems*, 4th Edition, 2012. 4. Roger S Pressman. *Software Engineering – A Practitioners Approach*, McGraw Hill, 2006. 5. Michael Blaha and James Rumbaugh. *Object-oriented modeling and design with UML*, 2ed edition, Prentice Hall, 2005. 6. G Booch, J Rumbaugh, and I Jacobson. *The Unified Modelling Language User Guide,* 2nd Ed., Addison Wesley, 2005. 7. T. Lethbridge and R. Laganiere.*Object-Oriented Software Engineering: Practical Software Development using UML and Java*, 2nd Ed., 2004. 8. Alan Shalloway, James R. Trott.*Design Patterns Explained: A New Perspective on Object-Oriented Design*, Addison Wesley, 2001. 9. Karl J. Lieberherr. *Adaptive Object-oriented Software: The Demeter Method with Propagation Patterns*, PWS Publishing Company, 1996. 10. https://decibel.ni.com/content/docs/DOC-2875. Journal papers will be available in the course website.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Major Exam	The major exam will be an in-class 90 minutes exam that will consists of short-answer, essay, and problem solving questions, and cover the topics studied in the first 9 weeks.	A1,A2,B1,B2, B3,C1,C2	20%
Two Assignments	The assignments consist of essay, problem-solving and literature review. The purpose of the assignments is to assess students where they have to demonstrate their extensive and detailed knowledge and critical awareness of current research, trends and advancements in software engineering and object-oriented software development methodology. The assignments will also assess students' skills in applying problem solving approaches to elicit and analyze requirements of stakeholders, design and model solutions. Soft copy submission is required through the course page in Moodle where answers will be checked by Turnitin against plagiarism.	A2, C2, B2, B3, D1, D3	(10% + 10% =) 20%
Exercises	In-class exercises consist of problem solving and application of different tools and models to model and design software components. Each exercise will be one hour duration.	B1,B2, B3	Formative Assessment
Team Project	Student teams will propose and develop a medium-sized project of their own. Soft copy submission is required through the course page in Moodle where the project report will be checked by Turnitin against plagiarism.	A2, B1,B2, B3, C1, C2, C3, D1, D2, D3	20% Method of Evaluation: Completeness(8 marks) Quality(3 marks) Creativity(2 marks) Presentation: report quality, and oral presentation (flow of information, student personality, understanding and Q/A) (5 marks)

			Team Work (team embers meeting minutes) (2 marks)
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions.	A1,A2,B1,B2, B3,C1,C2	40%
Overall:			**100 %**

Admissions	
Pre-requisites	**None**
Minimum number of students	**4**
Maximum number of students	**25**

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COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: **ITCS 515 – Business Intelligence**

Weight: **(3 - 0 - 3)**

Prerequisite: NONE

NQF Level Allocated: Level 9

NQF Notional Hours / Credits: 120 notional hours/ 12 NQF credit

Description: Business intelligence (BI) refers to the science of using advanced analysis and reporting tools to discover the necessary information used by an organization to make sound decisions. In this course, students will learn how to maximize business advantage by locating, extracting and dispersing information. Moreover, students will be introduced to some BI software and tools such as Microsoft BI. The covered topics include business intelligence framework, infrastructure, and current techniques used to extract, transform, and analyze business data, and to discover knowledge to support business decision-making

Objective:

1.   To understand a range of specialized theories, principles and concepts of BI.
2. To explain how to maximize business advantage by locating, extracting and dispersing information.
3. To explain the importance of BI in large and medium-sized corporations.
4. To critically explore various and advanced techniques, tools and good practices in BI.
5. To research current trends of BI practices and applications in industry.

SEMESTER: ACADEMIC YEAR:

INSTRUCTOR:
OFFICE TEL:
EMAIL:

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** *Demonstrate critical knowledge and understanding of key concepts and theories of BI, data warehousing and data mining.*	Knowledge: theoretical understanding [Level 9]
A2	***Contemporary Trends, Problems and Research:*** *Demonstrate an informed and critical awareness of the current research, trends and advancements in decision-support systems and BI applications, integration, technologies and tools.*	Knowledge: theoretical understanding [Level 9]
A3	***Professional Responsibility:*** Demonstrate cognizance of and adhere to the IT-related roles and responsibilities of professionals working in BI environments.	Knowledge: theoretical understanding [Level 9]

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Critically analyze and identify business problems, and develop BI solutions for them to inform decision making.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: practical application [Level 9]
B2	**Modeling and Design:** Develop a multidimensional data models and design BI systems to facilitate decision making.	Knowledge: practical application [Level 9]
B3	*Application of Methods and Tools:* Apply data mining techniques, OLAP, and BI software to generate business intelligence.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: practical application [Level 9]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Evaluate the complexity of challenging business processes and critically analyze its decision support systems, structured and unstructured data, resources, roles, risks, and performances to generate useful information and knowledge that lead to effective and efficient enhancement of the business processes.	Generic problem solving and analytical skills [Level 9]
C2	**Synthetic:** Integrate individual software components with other components such as a Neural Network classifier in order to create a larger AI system with more capabilities.	Generic problem solving and analytical skills [Level 9]
C3	**Creative:** Identify new business problems, processes or decision-support systems that can be solved or improved efficiently using advanced BI methods, techniques and tools in a way that supports insight and improve decision making.	Generic problem solving and analytical skills [Level 9] Competence: Autonomy, Responsibility and Context [Level 9]

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Develop an ability to effectively communicate with peers, and senior colleagues. Honing presentations skills in project report writing and oral presentation.	Communication, ICT and Numeracy Skills [Level 9]
D2	*Teamwork and Leadership:* Work as a member/leader of a team project for developing a BI solution for business problem.	Competence: Autonomy, Responsibility and Context [Level 9]
D3	*Organizational and Developmental Skills:* Engage in life-long learning and continuing self-development to enhance and practice professional and organizational skills in order to effectively prioritize,	Competence: Autonomy, Responsibility

	plan, manage and allocate appropriate time to implement tasks in BI projects and assignments.	and Context [Level 9]
D4	*Ethics and Social Responsibility:* Understand and adhere to the ethical values and responsibilities involved in, e.g., the analysis of business data and information.	Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)

<table>
<tr><th colspan="7">Course Structure (Outline)</th></tr>
<tr><th rowspan="2">Week</th><th colspan="2">Hours</th><th rowspan="2">ILOs</th><th rowspan="2">Topics</th><th rowspan="2">Teaching Method</th><th rowspan="2">Assessment Method</th></tr>
<tr><th>Lec.</th><th>Lab</th></tr>
<tr><td>1</td><td>3</td><td>-</td><td>A1</td><td>**Introduction to BI**</td><td>Lecture/ Class discussion</td><td>Major Exam (9th week) and Final Exam (Last Week)</td></tr>
<tr><td>2</td><td>3</td><td>-</td><td>A1</td><td>**Business Intelligence**: Concepts, components, framework and importance of BI</td><td>Lecture/ Class discussion</td><td>Major Exam (9th week) and Final Exam (Last Week)</td></tr>
<tr><td>3, 4</td><td>3</td><td>-</td><td>A1,A2, D1, D3, D4</td><td>**Business Intelligence:** how BI supports decision process, and Decision Support Systems</td><td>Lecture/ case studies/ Independent learning</td><td>Major Exam (9th week) and Final Exam (Last Week)/ **Research Assignment1**</td></tr>
<tr><td>5</td><td>3</td><td>-</td><td>A1,A2, C2, D1, D3, D4</td><td>**Data Warehouses, and Data Marts**</td><td>Lecture/ Class discussion/ Independent learning</td><td>Project (week 15)/ Major Exam (9th week) and Final Exam (Last Week)/ **Research Assignment 2**</td></tr>
<tr><td>6</td><td>3</td><td>-</td><td>C2</td><td>**ETL:** Data Extracting, Transformation, and Loading;</td><td>Lecture/ Class discussion</td><td>Project (week 15)/ Major Exam (9th week) and Final Exam (Last Week)</td></tr>
</table>

7	3	-	A1,B2, C1	**OLAP:** Online Analytical Processing, applications, multidimensional data, functionality and architecture	Lecture/ Exercises/ Class discussion	**Exercises**/Major Exam (9th week) and Final Exam (Last Week)/ Project (week 15)
8	3	-	B3	**BI Tools**	**Software Demonstration**	Project(week 15)
9-11	9	-	A1, B1,B2,C1,C2	**Data Mining**: Data mining concepts, process, data mining techniques	Lecture/ Class discussion/ Exercises	**Exercises**/ Project (week 15)/ **Major Exam** (9th week) and Final Exam (Last Week)
12	3	-	A2, B1,B2,C1,C2, D1, D3, D4	**Data Mining**: Intelligent Techniques, such as genetic algorithm and neural networks	Lecture / Exercises/ Independent learning	**Exercises**/Project (week 15)/ **Research Assignment3**/ Final Exam (Last Week)
13	3	-	B3	**Data Mining Tools**	**Software Demonstration**	Project (week 15)
14	3	-	A3, B1,B2, C1,C2	**BI Project Planning**	Lecture/ Class discussion	Project (week 15)/Final Exam (Last Week)
15	3	-	A2, A3, B1,B2,B3, C1,C2,C3,D1,D2,D3, D4	BI team research project presentations	Student research project presentations/ discussion	**Evaluation of Research Project Reports and Presentations**
16	2					**Final Exam (**A1, A2,A3,B1, B2, C1, C2)

Teaching Materials:

Textbook(s):	C. Vercellis, *Business Intelligence: Data Mining and Optimization for Decision Making,* Wiley, 2009.

	C. Howson, *Successful Business Intelligence: Unlock the Value of BI & Big Data*, 2nd Ed., McGraw-Hill Osborne Media, 2013.
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Rick Sherman, *Business Intelligence Guidebook: From Data Integration to Analytics,* 1st Edition, 2014. 2. Jiawei Han, Micheline Kamber, Jian Pei Simon, *Data Mining - Concepts and Techniques,* 3rd Edition, Elsevier, 3rd Edition, 2011. 3. Rajiv Sabherwal and I. Becerra-Fernandez, *Business Intelligence,* Wiley, 2011. 4. Turban, R. Sharda, D. Delen, D. King, *Business Intelligence: A Managerial Approach,* Pearson, 2013. 5. R. Kimball and M. Ross, *The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling*, 3rd Ed., Wiley, 2013. 6. Ramesh Sharda, Dursun Delen, Efraim Turban, *Analytics, Data Science, & Artificial Intelligence: Systems for Decision Support*, 11th Edition, 2019. 7. L. Torgo, *Data Mining with R: Learning with Case Studies*, Chapman and Hall/CRC, 2010. 8. M. Hofmann and R. Klinkenberg, *RapidMiner: Data Mining Use Cases and Business Analytics Application,* Chapman and Hall/CRC, *2013.* 9. More references are available in the course website in Moodle.

ASSESSMENT:

Type of Assessment	Description	ILOs	Weighting
Three Research Assignments	The assignments consist of essay, problem-solving and research based theoretical questions regarding topics in business intelligence (BI). The purpose of the assignments is to assess students where they have to demonstrate their extensive and detailed knowledge and critical understanding of key concepts, theories, methods, tools and techniques of BI. The assignment will also assess students' skills to identify and formalize business processes and develop BI solutions for them to inform decision making. Soft copy submission is required through the course page in Moodle where answers will be checked by Turnitin against plagiarism.	A1, A2, B1, B2, C1, C2, D3, D4	20%
Exercises	In-class exercises consist of problem solving and application of different methods, algorithms, and data models. Each exercise will be one hour duration.	B1, B2, C1	Formative

Major Exam	The major exam will be an in-class 90 minutes exam that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 7 weeks.	A1, A2, B1, B2, C1,C2	20%
Team Research Project Report and Presentation	Starting from weak 4, the class will be divided into teams of 4-5 students and each will be asked to study a research problem in BI utilizing the skills and tools learned in class. Teams are required to plan and execute the research project that may involve the application of advanced techniques, skills and tools in BI and decision-support systems to develop solutions for business-related problems. In the final week, each team will have to submit their research report explaining the research problem, research methods used, analysis and the conclusion highlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation summarizing the research conducted and its findings. Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.	A2, A3, B1,B2,B3, C1, C2,C3, D1,D2, D3,D4	20%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions in data analytics.	A1, A2, A3,B1,B2, C1, C2	40%
		Overall	100%

Admissions	
Pre-requisites	NONE
Minimum number of students	4
Maximum number of students	25

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COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 516 – Object Oriented Programming

Weight: (3 - 0 - 3)

Prerequisite: None

Description:

An intensive course on object-oriented programming (OOP) paradigm and advanced techniques of the Java language. Topics include: Java, Object Model, Classes and Objects, Constructors and Destructors, Inheritance, Virtual Functions and Polymorphism, Operator Overloading, Exceptions, Generic Programming and Standard Template Library.

Objective:

1. To overview the fundamental concepts of object-oriented programing.
2. To explain the design of programs with the object-oriented (OO) paradigm making proper use of inheritance, and polymorphism.
3. To apply object–oriented concepts and software development tools (programming editor, compiler, and debugger) in developing Java programs.
4. To emphasize the importance of abstraction and the reuse of java programs.

Semester: 1

Instructor (s): Dr. Subha

Office Telephone: 17298947   **Email (s): sbhaskaran@ahlia.edu.bh**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding	NQF Level
A1. Concepts and Theories: Demonstrate knowledge and understanding of Object Oriented Programming paradigm and design such as Object, Class, Data Abstraction and Encapsulation, Inheritance, Polymorphism.	Knowledge: theoretical understanding [Level 8]

B. Subject-Specific Skills	NQF Level
B1 Problem Solving: Develop a formal definition of real life problems and solve them by developing an algorithmic solution, basic programming constructs and Object Oriented Programming.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2. Modeling and Design: Develop models for real-world problems and design their solutions using Object Oriented Programming by specifying the Objects, Classes, and their respective set of Properties and Methods using UML models.	Knowledge: Practical Application [Level 8]
B3. Application of Methods and Tools: Apply the appropriate methods and techniques to design, implement and test Object Oriented Programming using UML, JAVA and Eclipse IDE.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]

C. Critical Thinking Skills	NQF Level
C1. Analytic: Analyze and evaluate the performances of different phases in Object Oriented Programming and identify scope, objectives and characteristics in addition to the requirements for every step.	Generic Problem Solving & Analytical skills [Level 8]
C2. Synthetic: Choose the best suitable techniques, algorithms, and data structures to design and develop efficient Object Oriented Programming to solve new problems.	Generic Problem Solving & Analytical skills [Level 8]

D. General and Transferable Skills	NQF Level
D1. Communication: Demonstrate ability to communicate information in appropriate oral and written forms using UML, flowcharts and pseudo codes that are necessary to depict problem solving.	Communication, ICT and Numeracy Skills [Level 8]
D3. Organizational and Developmental Skills: Engage in life-long learning and continuing self-development to enhance and practice professional and organizational skills in order to effectively prioritize, plan, manage and allocate appropriate time to implement and test object oriented programs.	Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	3	-	A1,B1,C2	**Introduction to OOP:** Features of OOP, OOP Concepts and Themes, Benefits of OOP.	Lecture/ class discussions	Class Participation
2	3	-	A1,B1,B2, B3,C2	**OOP Paradigm & Themes:** Defining a Class, Attributes and Methods of a Class, Static Members, and Objects as Function Arguments.	Lecture/ class discussions	Class Participation
3-4	6	-	A1,B1,B2, B3,C2	**OOP Paradigm & Themes:** Default and Explicit Constructors, Parameterized Constructors, Multiple Constructors in a Class.	Lecture / Lab demonstration	Assignment 1
5	3	-	A1,B1,B2, B3,C2,D1	**Introduction to UML**	Lecture/ Lab demonstration	Class Participation
6	3	-	A1,B3,D1,D3	**Introduction to Eclipse and Java Language**	Lecture/ Lab demonstration	In-lab practical Exercise 1 / Class Participation
7	3	-	A1,B1,B2, B3,C2,D1	**Inheritance:** Superclasses and Subclasses, Single Inheritance, Is-a Relationship, Class Hierarchies.	Lecture/ Lab demonstration	Quiz/In lab exercise
8	3	-	A1,B1,B2, B3,C2,D1,D3	**Inheritance:** Syntax of Java Inheritance, The super Reference Method, Overriding.	Lecture/ Lab demonstration	In-lab practical Exercise 2
9	3	-	A1,B1,B2, B3,C1,C2, D1	**Polymorphism:** Pointers to Objects, This Pointer, Abstract Classes, Abstract Methods, Signature of a method, Overriding abstract methods, Arrays of related objects.	Lecture/ Lab demonstration	Written Test / Class Participation

10	3	-	A1,B1,B2, B3,C1,C2,D1 ,D3	**Polymorphism:** The Object class, The instance of operator, Interfaces, Defining an Interface, How a class implements an interface.	Lecture/ Lab demonstration	In-lab practical Exercise 3 / Class Participation
11	3	-	A1,B1,B2, B3,C1,C2, D1,D3	**Exception Handling:** Exceptions and Exception Types, Throwing Exceptions, Catching Exceptions. Creating Your Own Exception Classes, The finally Clause Cautions, chained exceptions, precondition and preconditions, Assertions.	Lecture/ Lab demonstration	Assignment 2
12	3	-	A1,B1,B2, B3,C1,C2, D1,D3	**Generics:** Introduction and motivation for Generic types and methods, Examples of generic types and methods	Lecture/ Lab demonstration	In-lab practical Exercise 4 / Class Participation
13	3		A1,B1,B2, B3,C1,C2, D1	**Generics:** Generic methods, overloading generic methods. Generic Classes, Generics and inheritance	Lecture/ Lab demonstration	Class Participation
14	3		A1,B1,B2, B3,C1,C2, D1,D3	**Abstract Data Types & Java Collection Package**	Lecture/ Lab demonstration	In-Class practical Exercise 5 / Class Participation
15	3		A1,B1,B2, B3,C1,C2, D1,D3	**Abstract Data Types & Java Collection Package Revision**	Lecture	Class Participation
16	2					Final Exam

ASSESSMENT:

Type of Assessment[1]	Description[2]	ILOs[3]	Weighting
Assignment 1	The assignment consists of some short-answer and essay questions on object oriented concepts and theories covered in class up to week 3. Soft copy submission is required by the end of the 4th week	A1,B1,B2, B3,C2	10%

	through the course page in Moodle where answers will be checked by Turnitin against plagiarism.		
Assignment 2	The assignment consists of some short-answer and essay questions on object oriented concepts and theories covered in class up to week 11, in addition to programming questions where the student is required to design, implement and test some Java programs by using object oriented methodology. Soft copy submission is required by the end of the 12th week through the course page in Moodle where answers will be checked by Turnitin against plagiarism. Java programs will be submitted electronically to be tested.	A1,B1,B2, B3,C1,C2, D1,D3	10%
In-lab Practical Exercises	Each of the five practical exercises consists of a set of practical tasks to be implemented by students individually in class as shown in the above weekly structure. Each of the exercises assesses the students skills in the application of object oriented methods and techniques to code and test JAVA programs using Eclipse IDE. Students work will be observed and evaluated directly during the lab sessions.	Exercise 1: A1,B3,D1,D3	2%
		Exercise 2: A1,B1,B2, B3,C2,D1,D3	2%
		Exercise 3: A1,B1,B2, B3,C1,C2, D1,D3	2%
		Exercise 4: A1,B1,B2, B3,C1,C2, D1,D3	2%
		Exercise 5: A1,B1,B2, B3,C1,C2, D1,D3	2%
Quiz	The quiz will consist of MCQs, short-answer, essay, and problem solving questions and will cover the topics studied in the first 7 weeks. The duration of the quiz is 20 minutes and will be taken in class. The purpose of the quiz is to assess the students' knowledge and understanding of key concepts, principles and theories of OOP as well as their skills in problem solving and modeling and design using UML.	A1,B1,B2,D1	10%
Written Test	The written test will be an in-class 1-hour test that will consists of MCQs, short-answer, essay, and problem solving questions and cover the topics studied in the first 9 weeks. Students will be asked	A1,B1,B2, B3,C1,C2, D1	20%

	also to write some parts of Java programs to solve problems using object oriented methodology.		
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of MCQs, short-answer, essay and problem-solving questions in object oriented concepts and theories as well as Java programming language. Students will be asked also to design algorithmic solutions to some defined problems using the appropriate Object-oriented paradigms, methods and techniques and to define and model precisely the required objects and classes and highlight their components and relationships using UML.	A1,B1,B2, B3,C1,C2, D1	40%
		Overall	100%

TEACHING MATERIALS:

TEXTBOOK(S):   Deitel P.J., Deitel H.M. - Java How to Program, 11th Edition, 2019.

HANDOUT(S):   Instructor's power point slides, http://www.ahlia.edu.bh/moodle.

REFERENCE(S):   1. D.S. Malik, *Java Programming: From Problem Analysis to program*

   Design, Course Technology, Cengage Learning, 2012.

   2. Y. Daniel Liang, *Introduction to Java Programming, Brief Version*,

   9e, 2013.

   3. Ken Arnold, James Gosling, The Java   Programming Language,

   Addison – Wesley, 1996.

   4. David Arnow, Gerald Weiss, Introduction to Programming Using

   Java: An Objects Oriented Approach, Addison Wesley, 1998.

   5.   Head First Java, 2nd Edition 2nd Edition by Kathy Sierra (Author), Bert Bates (Author) #1 Best Seller in Java Programming.
   6.   Effective Java 3rd Edition by Joshua Bloch (Author), 2018, ISBN-13: 978-0134685991,ISBN-10: 0134685997.

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title:	**ITCS 518 – Mobile Application Development**
Weight:	**(3-0-3)**
Prerequisite:	**None**
NQF Level Allocated:	**9**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

Description: The course discusses the principles of design and development for mobile device applications. Students will learn how to develop, simulate, and test Android applications. The topics covered include Android platform; mobile hardware; cell networks; mobile architectures, operating systems, languages, development environments and simulators, and user interfaces; location-based services; data storage and retrieval.

Objective:

1. To explain how to design, develop, test and deploy Android mobile applications using modern mobile development tools.
2. To study the application of layout management and multi-layout techniques to create adaptable user interfaces for mobile applications that share a common data model.
3. To discuss the management of user data and multimedia on a mobile device via the Android framework libraries.
4. To explain how sensors available on mobile devices enhance user interaction and feedback

Semester:	**Second 2018-2019**
Instructor (s):	**Dr. Karim Hadjar**
Office Telephone:	**Email (s): khajjar@ahlia.edu.bh**

Intended Learning Outcomes (ILOs):

	A. Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate knowledge and understanding of key concepts and techniques of programming environments to design, code, test and deploy mobile applications	Knowledge: theoretical understanding [Level 9]
A2	**Contemporary Trends, Problems and Research:** Recognize the current computing issues and research on emerging mobile computing technologies.	Knowledge: theoretical understanding [Level 9]
A3	**Professional Responsibility:** Demonstrate an awareness of professional ethics and responsibilities related to Mobile application development through case studies dealing with real life examples	Knowledge: theoretical understanding [Level 9]

	B. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Design, code, test and deploy efficiently mobile applications having in mind the different designs, techniques of coding and deployment of mobile applications discovered through research.	Skills: Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical Understanding [Level 9] Competence: Context [Level 8]
B2	**Modeling and Design:** Design the architecture of mobile applications which comprises the user interface and its components and the main functionalities of the mobile application by having in mind the different designs of mobile applications discovered through research.	Skills: Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical Understanding [Level 9] Competence: Context [Level 8]
B3	**Application of Methods and Tools:** Use and apply appropriate development tools such as Android Studio to develop and manipulate mobile applications.	Skills: Communication, ICT and Numeracy Skills

			[Level 9] Knowledge: Practical Understanding [Level 9] Competence: Context [Level 8]

	C. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Critically evaluate and test the results of output of the developed mobile applications.	Generic cognitive skills [Level 9]
C2	**Synthetic:** Construct and reuse the multiple components of software/system for developing the mobile applications.	Generic cognitive skills [Level 9]
C3	**Creative Thinking and innovation:** Create efficient Modern User Interfaces for the mobile applications.	Generic cognitive skills [Level 9]

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Express and communicate ideas effectively, in written and oral form to their colleagues and/or Instructor, as appropriate.	Communication, ICT and Numeracy Skills [Level 9]
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a team of technical people who may plan, design, implement, manage, monitor a project	Competence: Autonomy & Responsibility [Level 9] Competence: Learning to learn [Level 9]
D3	**Organizational and Developmental Skills:** Engage in life-long learning and continuing self-development to hone professional and organizational skills. Assimilate effective work habits including but not limited to time management	Competence: Learning to learn [Level 9]
D4	**Ethics and Social Responsibility:** Recognize, accept, and follow ethical and social responsibility and respond positively to the needs of society by identifying, employing and utilizing effectively the advanced computing and information solutions and technologies	Competence-Insight [Level 8]

Course Structure (Outline)

Week	Hours Lec.	Hours Lab	ILOs	Topics	Teaching Method	Assessment Method
1	3	-	A1, D4	Android Introduction	Lecture/ Lab session demo	-
2	3	-	A1, D4	Android Development Tools	Lecture	Class Participation (A1)
3	3	-	A1, B2, B3, C2, D1	Android First Application	Lecture/ Lab session demo, Exercises	Class Participation (A1,D1)
4	3	-	A1, B2, B3, C2, C3, D1	Android Structure of the Application	Lecture/ Lab session demo	Class Participation (A1,D1)
5	3	-	A1, B1, B3, C1, C2, D1, D3	Android UI Part 1: TextView, ImageView, ScrollView	Exercises	Class Participation (A1,D1)/ **Programming Project 1 (A1, B1, B3, C1, C2, D1, D3)**
6	3	-	A1, B2, B3, C1, C2	Android Activity	Lecture/ Lab session demo, Exercises	Class Participation (A1)
7	3	-	A1, B1, B2, B3, C1, C2, D1	Android UI Part 2: MediaPlayer, Button, Start a new Activity	Lecture	Class Participation (A1,D1)/ **Midterm Exam (A1, B1, B2, B3, C1, C2)**
8	3	-	A1, B1, C1, D1	Exporting Android App	Lecture, Exercises	Class Participation (A1,D1)

9	3	-	A1, B3, C1, C2, D1	Debugging Android App	Lecture/ Lab session demo, Exercises	Class Participation (A1,D1)
10	3	-	A1, B1, B2, B3, C1, C2, C3, D3	Android UI Part 3: EditText, RadioGroup, RadioButton	Lecture/ Lab session demo, Exercises	Class Participation (A1) / **Programming Project 2 (A1, B1, B2, B3, C1, C2, C3, D3)**
11	3	-	A1, A2, A3,B1, B2, C1, C3	Android UI Part 4: EditText, TextView, Button Form Validation	Lecture, Exercises	Class Participation (A1)
12	3	-	A1, A2, A3,B1, B2, C1, C3	Android UI Part 5: ListView.	Lecture/ Lab session demo, Exercises	Class Participation (A1)
13	3	-	A1, A2, A3, B1, C1, C2, C3, D3, D4	Android UI Part 6: Action Bar.	Lecture, Exercises	Class Participation (A1)/ **Research Assignment (A1, A2, A3, B1, C1, C2, C3, D3, D4)**
14	3	-	A1, A2, A3, B1, C3, D4	Android UI Part 7: WebView. & Android Database SQLite	Lecture, Exercises	Class Participation (A1,D4)
15	3	-	A1, A2, A3, B1, B2, B3, C1, C2, C3,	Putting It All Together, Student presentations and reports of team research projects	Lecture, student presentations	Class Participation (A1,D1)/ Evaluation of

| | | | D1, D2, D3,D4 | | | **Team Project Presentations & Reports (A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D2, D3,D4)** |

* Formative assessment

Teaching Materials:

Textbook(s):	Reto Meier and Ian Lake, *Professional Android (4th edition),* Wrox, 2018, ISBN: 978-1118949528
Handout(s):	Power point slides, http://www.ahlia.edu.bh/moodle.
Reference(s):	1. Teg Hagos, *Learn Android Studio 3*, Apress, 2018, ISBN: 978-1484231555 2. Mark Wickham, *Practical Android: 14 Complete Projects on Advanced Techniques and Approached*, Apress, 2018, ISBN: 978-1484233320 3. Neil Smyth*, Android Studio 3.0 Development Essentials – Android 8 Edition,* CreateSpace Independent Publishing Platform, 2017, ISBN: 978-1977540096 4. B. Phillips and B. Hardy, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch Guides, 2013. 5. I. G. Clifton, *Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps*, Addison-Wesley Professional, 2013. 6. Google Android Studio, https://developer.android.com/studio/ 7. Google, Android Developer Resources, https://developer.android.com/index.html

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting

Research Assignment	The assignment consists of essay, problem-solving and research based theoretical questions including topics covered in weeks 13 and 14. The purpose of the assignment is to assess students individually where they have to demonstrate their extensive and detailed knowledge and critical awareness of current research, trends and advancements in mobile applications. The assignment will also assess students' skills in designing, coding, testing and deploying efficient and interactive mobile applications having in mind the different designs, techniques of coding and deployment of mobile applications discovered through research. Soft copy submission is required by the end of the 10th week through the course page in Moodle where answers will be checked by Turnitin against plagiarism. Any implementation code developed during this assignment will have to be submitted also electronically to be tested and evaluated.	A1, A2, B1, C1, C2, C3, D3, D4	10%
Programming Project 1	Students will be asked (individually) to use and apply appropriate development tools such as Android Studio to develop and manipulate specific mobile applications. The output of the programming project should be submitted electronically by the end of week 6 to be tested and evaluated. Student programs will be evaluated in lab sessions where students have to justify their choices of the design and architecture of the developed applications.	A1, B1, B3, C1, C2, D1, D3	8%
Programming Project 2	Same as Project 1 where students has to code, test and deploy interactive mobile applications with more emphasizes on the use of creative efficient Modern User Interfaces, communication, telephony, graphics and multimedia components. Students will be assessed also on their skills to construct and reuse multiple components of the mobile application. The output of the programming project should be submitted electronically by the end of week 11 to be tested and evaluated. Student programs will be evaluated in lab sessions where students have to justify their choices of the design and architecture of the developed applications.	A1, B1, B2, B3, C1, C2, C3, D3	8%
Class Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures and lab sessions. Feedback will be given to students to reaffirm their learning outcomes.	A1, D1, D4	Formative
Midterm Exam	The midterm exam will be an in-class 1-hour exam that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 7 weeks. Students will be asked to design and write the code of some components of mobile applications.	A1, B1, B2, B3, C1, C2	18%

Team Research Project (Report and Presentation)	Starting from weak 4, the class will be divided into teams of 4-5 students where each team will be asked to study a research problem in mobile application development utilizing the knowledge, skills and tools learned in class. Teams are required to plan and execute the research project that must involve a main component of designing, coding, testing and deploying efficient and interactive multimedia mobile applications. In the final week, each team will have to submit their research report (worth 10%) explaining the research problem, research methods used, analysis and the conclusion highlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation (worth 6%) summarizing the research conducted and its findings. Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.	A1, A2, B1, B2, B3, C1, C2, C3, D1, D2, D3,D4	16%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions. Students will be asked to design and write the code of some components of mobile applications.	A1, A2, B1, B2, B3, C1, C2, C3	40%
Overall:			**100 %**

Admissions	
Pre-requisites	None
Minimum number of students	4
Maximum number of students	20

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

<u>**COURSE SYLLABUS/ SPECIFICATION**</u>

Course Code & Title:	**ITCS 520 – Big Data Analytics**
Weight:	**(3 - 0 - 3)**
Prerequisite:	**ITCS 511**
NQF Level Allocated:	**9**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

Description: This course covers foundational techniques and tools required for data science and big data analytics. The course focuses on concepts, principles, and techniques applicable to any technology environment and industry with emphasis on systems and algorithms for large-scale advanced data analysis. Topics covered include concepts and algorithms for building big data systems, data analytics lifecycle, basic and advanced analytics methods, and emerging big data technology and tools.

Objective:

1. To explain advanced big data analytics concepts, techniques and methods.
2. To teach students how to apply big data analytics lifecycle and use advanced tools to address real business problems.
3. To explain and demonstrate the effective use of emerging big data technologies such as Hadoop and MapReduce

Semester:	**First 2019-2020**
Instructor (s):	**Dr. Karim Hadjar**
Office Telephone:	**Email (s):** khajjar@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

	A. Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate extensive knowledge and critical understanding of key concepts and theories of big data analytics.	Knowledge: theoretical understanding [Level 9]
A2	**Contemporary Trends, Problems and Research:** Demonstrate an informed and critical awareness of the current trends and advancements in big data analytics techniques, technologies and applications.	Knowledge: theoretical understanding [Level 9]
A3	**Professional Responsibility:** Demonstrate knowledge and understanding of techniques used to preserve appropriate level of privacy and security needed in big data systems.	Knowledge: theoretical understanding [Level 9]

	B. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Develop solutions for business-related problems by applying the big data analytics lifecycle including discovery and formalization, data preparation, planning, implementation and results communication.	Skills: Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical Understanding [Level 9] Competence: Context [Level 8]
B2	**Modeling and Design:** Develop appropriate models for big data systems and visualization of analytics results to convey clear insights.	Skills: Communication, ICT and Numeracy Skills [Level 9]

		Knowledge: Practical Understanding [Level 9]
		Competence: Context [Level 8]
B3	**Application of Methods and Tools:** Apply effectively the appropriate big data analytic methods and tools used to analyze big data and facilitate informed decision making (such as Rstudio, Hadoop and MapReduce).	Skills: Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical Understanding [Level 9] Competence: Context [Level 8]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Analyze sets of big data critically to generate useful insights and inform decision making.	Generic cognitive skills [Level 9]
C2	**Synthetic:** Identify technological requirements, architecture, and infrastructure needed to build up big data systems and address risk related issues.	Generic cognitive skills [Level 9]
C3	**Creative Thinking and innovation:** Identify new areas and ways to apply and communicate results of big data analytics lifecycle creatively to support insights and address emerging business challenges.	Generic cognitive skills [Level 9]

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Express and convey ideas rigorously and effectively, in written and oral form, to a diverse range of stakeholders using visualization techniques and tools.	Communication, ICT and Numeracy Skills [Level 9]

D2	**Teamwork and Leadership:** Work effectively as a member/leader of a team in order to complete a big data analytics research project.	Competence: Autonomy & Responsibility [Level 9] Competence: Learning to learn [Level 9]
D3	**Organizational and Developmental Skills:** Engage in life-long learning and continuing self-development to enhance and practice professional and organizational skills in order to effectively prioritize, plan, manage and allocate appropriate time to implement tasks in big data projects and assignments.	Competence: Learning to learn [Level 9]
D4	**Ethics and Social Responsibility:** Understand and demonstrate awareness of the benefits that big data analytics bring to organizations and the ethical and privacy risks they might pose.	Competence-Insight [Level 8]

Course Structure (Outline)

Course Structure (Outline)					
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	3	-	A1	**Introduction and overview:** Structured vs. unstructured data, relational databases, big data concepts, characteristics and importance, data sciences and analytics.	Lecture	Class Participation (A1)
2	2	-	A1,B1,B2,C1,C2	**Examples of big data applications and solutions for business problems:** strategic planning, platform	Lecture/ case study/ discussion/ group debate	Class Participation (A1, C2)
2	1	-	A1,A3,C1,C2,D4	**Examples of big data applications and solutions for business problems:** security and privacy concerns, risk management.	Lecture/ case study/ discussion/ group debate	Class Participation (A1,C1,D4)
3	2	-	A1,B1,B2,C2, D3	**Data Analytics Lifecycle:** Discovery, Data Preparation, Model Planning, Model Building,	Lecture	**Research Assignment 1 (A1,B1,B2,C2, D3)** / Class

						Participation (A1)
3	1	-	A1,B1,B2,C1,D1	**Data Analytics Lifecycle:** Results Communication, Operationalization	Lecture	Class Participation (A1,D1)
4	2	-	A1, B2,B3,D1, D3	**Basic Data Analytic Methods**: Introduction to RStudio	Lecture/ Lab session demo	Class Participation (A1)
4	1	-	A1,B2, B3,C1, D1, D3	**Basic Data Analytic Methods**: analyzing and exploring data by R	Lecture/ Lab session demo	**Project 1** (B2,B3,C1, D3) /Class Participation (A1,D1)
5	1	-	A1,B2, B3,C1, D1, D3	**Basic Data Analytic Methods**: analyzing and exploring data by R	Lecture/ Lab session demo	Class Participation (A1,D1)
5	2	-	A1, B2,B3,C1,C2,C3,	**Basic Data Analytic Methods**: statistics for model building and evaluation	Lecture	Class Participation (A1)
6	3	-	A1,B1,C1,C2, D1	**Advanced Data Analytics Theory And Methods:** Supervised & unsupervised learning	Lecture/use cases	Class Participation (A1)
7	2	-	A1,B1,B2,C1,C2,C3	**Advanced Data Analytics Theory And Methods:** clustering, association rules	Lecture/use cases	**Research Assignment 2** (A1, B1, B2, C1, C2, C3)/ Class Participation (A1, C1)
7	1	-	A1,B1,B2,C1,C2,C3	**Advanced Data Analytics Theory And Methods:** regression, classification	Lecture/use cases	Class Participation (A1, C1)
8	2	-	A1,B1,B2,C1,C3	**Advanced Data Analytics Theory And Methods:** decision trees, time series analysis, text analysis	Lecture/use cases	**Midterm Exam (**A1,B1,B2,C1,C3**)** / Class

						Participation (A1, C1)
8	1	-	A1, B2, C2,C3	**Advanced Data Analytics Theory And Methods:** networks and graphical models, Dimension reduction	Lecture/use cases	Class Participation (A1)
9	3	-	A1,B1,B2,C1,C2	**Advanced Technologies and Tools:** Data storage and analytics for unstructured data	Lecture	Class Participation (A1,C1)
10	3	-	B2,B3,C1,C2,D1,D3	**Advanced Technologies and Tools:** MapReduce and Hadoop, Hadoop Ecosystem	Lecture/ Lab session demo	Class Participation (A1, D1)
11	3	-	A1,B2,B3,C1,C2	**Tools for SQL-like access to unstructured data**: Pig and Hive	Lecture/ Lab session demo	**Project 2** (B2,B3,C1, C2) / Class Participation (A1)
12	3	-	A1,B2,B3,C1,C2, D3	**NoSQL storage solutions**: HBase, Cassandra, and Oracle NoSQL,	Lecture/ Lab session demo	Class Participation (A1)
13	3	-	A1,A3,B1,B2,C3,D1,D4	**Operationalization of data Analytics Project:** Creating the final deliverables, data visualization techniques, privacy, ethics, governance	Lecture	Class Participation (A3,D4)
14	3	-	A1, A2,A3, B1, C3,D1,D4	**Research & Trends:** Cloud & big data, SaaS business intelligence, globally distributed storage systems, Google data center infrastructure, data visualization, automation, semantics, predictive analytics, social media analytics	Lecture/ discussion/ group debate	Class Participation (A1, D4)
15	3	-	A1,A2, A3, B1,B2,B3, C1,C2,C3, D1,D2, D3, D4	Team research project report and presentations by students	Students Project Presentations	**Evaluation of Research Project Outcomes and Presentations (**A1,A2, A3, B1,B2,B3, C1,C2,C3, D1,D2, D3, D4**)**

						Final Exam
16	2	-				(A1, A3, B1,B2,B3, C1,C2, D4)

Teaching Materials:

Textbook(s):	1- Nataraj Dasgupta, *Practical Big Data Analytics,* Packt Publishing, 2018. **2-** Cory Lesmeister. *Matering Machine Learning with R – Second Edition*. Packt Publishing, 2017.
Handout(s):	Power point slides, http://www.ahlia.edu.bh/moodle.
Reference(s):	1. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, Shroff/O'Reilly, 2017. 1. Sunila Gollapudi, Practical Machine Learning, Packt Publishing, 2016. 2. M. Minelli, M. Chambers and A. Dhiraj, Fundamentals of Deep Learning: Designing next generation Machine Intelligence Algorithms, Shroff/O'Reilly, 2017. 3. Sam R. Alapati, Expert Hadoop Administration: Managing, Tuning, and Securing Spark, YARN, HDFS, First Edition, Pearson Education, 2017. 4. Gurmukh Singh, Hadoop 2.x Administration Cookbook, Packt Publishing, 2017. 5. Dipayan Dev, Deep Learning with Hadoop, Packt Publishing, 2017. 6. Dr. PKS Prakash, R Deep Learning Cookbook, Packt Publishing, 2017. 7. Tom M. Mitchell, Machine Learning, First edition, McGraw Hill Education, 2017. 8. http://www.rstudio.com/ 9. https://mran.microsoft.com/open 10. http://tdwi.org/ 11. More references are available in the course website in Moodle.

Assessment

Type of Assessment[1]	Description[2]	ILOs[3]	Weighting
Research Assignment 1	The assignment consists of 6-8 essay, problem-solving and research based theoretical questions regarding topics in big data analytics covered during the first 3 weeks. The purpose of the assignment is to assess students individually where they have to demonstrate	A1, B1, B2, C2, D3	7%

	their extensive and detailed knowledge and critical understanding of key concepts, theories, methods, tools and techniques of big data analytics. The assignment will also assess students' skills to solve and develop solutions for business-related problems by applying the big data analytics lifecycle. Soft copy submission is required by the end of the 4th week through the course page in Moodle where answers will be checked by Turnitin against plagiarism.		
Research Assignment 2	Similar to assignment 1 but topics will cover up to week 7. Soft copy submission is required by the end of the 8th week through the course page in Moodle where answers will be checked by Turnitin against plagiarism.	A1, B1, B2, C1, C2, C3	7%
Project 1	The practical project will assess students' skills in utilizing the R language and RStudio to analyze and explore big data. The students will be given examples of big data sets and will be asked to analyze them using R language and RStudio. Soft copy of the output should be submitted electronically by the end of week 5.	B2,B3,C1, D3	7%
Project 2	Students will be given a set of practical tasks to be implemented on real examples of big data using MapReduce, Hadoop, Pig and Hive. The purpose of the project is to assess students' skills (individually) in using the advanced big data analytics techniques and methods learned in class. Soft copy of the output should be submitted electronically by the end of week 12.	B2,B3,C1, C2	7%
Midterm Exam	The midterm exam will be an in-class 1-hour exam that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks.	A1,B1,B2,C 1,C3	20%
Team Research Project Report and Presentation	Starting from weak 4, the class will be divided into teams of 4-5 students and each will be asked to study a research problem in big data analytics utilizing the skills and tools learned in class. Teams are required to plan and execute the research project that may involve the application of advanced and specialized big data techniques, skills and tools to develop solutions for business-related problems by applying the big data analytics lifecycle. In the final week, each team will have to submit their research report (worth 10%) explaining the research problem, research methods used, analysis and the conclusion highlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation (worth 6%) summarizing the research conducted and its findings. Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.	A1,A2, A3, B1,B2,B3, C1,C2,C3, D1,D2, D3, D4	12%

Final Exam	The final exam is a 2-hour closed book and notes comprehensive exam. It will consist of short-answer, essay and problem-solving questions in big data analytics.	A1, A3, B1,B2,B3, C1,C2,C3, D4	40%
		Overall	100%

Admissions	
Pre-requisites	**ITCS 511**
Minimum number of students	**4**
Maximum number of students	**20**

College of Information Technology
Department of Information Technology
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title:	**ITCS 526: Cloud Computing**
Weight:	**(3 - 0 - 3)**
Prerequisite:	**None**
NQF Level Allocated:	**9**

NQF Notional Hours / Credits: 120 National Hours/12 NQF Credits

Description: This course covers how to build a cloud infrastructure based on a cloud computing reference model. The reference model includes five fundamental layers, namely, physical, virtual, control, and service and three cross-layer functions, namely business continuity, security, and service management for building a cloud infrastructure. For each layer and function, this course covers the comprising technologies, components, processes, and mechanisms. This course takes an open approach to describe concepts and technologies. Product examples are included to reinforce the concepts and technologies learnt in this course .

After completing this course, students will acquire knowledge to make informed decisions on technologies, processes, and mechanisms that are required to build cloud infrastructure

Objectives:

1. To explain Cloud computing concepts and principles
2. To discuss various approaches in cloud computing services,
3. 3. To explore cloud computing security and performance.

Semester: Second   2019-2020

Instructor: Yousif Albastaki

Office Telephone: 17298999- 8562

Email (s): yalbastaki@ahlia.edu.bh – albastakiyousif@gmail.com

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	Concepts and Theories: Demonstrate knowledge and understanding of concepts and theories related to architecture of Cloud Computing and its services: IaaS, PaaS and SaaS; and appreciate the importance of security aspects through cloud computing solutions.	Knowledge: theoretical understanding [Level 9]
A2	Contemporary Trends, Problems and Research: Demonstrate an informed and critical awareness of the cloud computing problems, research issues and technological advancements.	Knowledge: theoretical understanding [Level 9]
A3	Professional Responsibility: Demonstrate cognizance of and adhere to the professional and legal standards as a cloud computing user/consumer.	Knowledge: theoretical understanding [Level 9]
B. Subject-specific Skills		**NQF Descriptor/ Level**
B1	Problem Solving: Identify appropriate cloud computing service, plan an implementation approach, and its corresponding scope for the discussed cases.	Knowledge: theoretical understanding [Level 9] Communication, ICT and Numeracy Skills [Level 9]
B2	Modeling and Design: Model and design a cloud solution using one of the cloud computing services.	Knowledge: theoretical understanding [Level 9] Knowledge: practical application [Level 9]
C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	Analytic: Evaluate cloud computing services and possible approaches including identification of the corresponding benefits and challenges for each implementation.	Generic problem solving and analytical skills [Level 9] Communication, ICT and Numeracy Skills [Level 9]
C2	Synthetic: Design and model full cloud computing scenario including strategic objective(s) identification, corresponding service(s) selection, and the desired approach and scope implementation.	Generic problem solving and analytical skills [Level 9] Communication, ICT and Numeracy Skills [Level 9]

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	Communication: Express and communicate ideas cogently, persuasively and effectively, in written and oral form, to a diverse range of audiences and stakeholders through written test, final examination, group assignment, and research project.	Communication, ICT and Numeracy Skills [Level 9]
D2	Teamwork and Leadership: Work effectively as a member/leader of a team of technical people who may plan, design, implement, manage, monitor and evaluate a cloud computing solution scenario.	Competence: Autonomy, Responsibility and Context [Level 9]
D4	Ethical and Social Responsibility: Demonstrate awareness of, and adhere to, ethical and societal responsibilities in the area of cloud computing.	Competence: Autonomy, Responsibility and Context [Level 9]

Course Structure (Outline)

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Topics**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	3	0	A1, A3	**General Introduction:** What is a Cloud? Cloud Service Brokerage Cloud Deployment Models	Lecture	-
2	3	0	A1,A2, A3,C1	**Cloud Architecture:** Building the cloud Infrastructure Cloud Computing Reference Model Options for Building Cloud Infrastructure Consideration for Building cloud Infrastructure	Lecture, Group Discussion	Assignment 1 2% A2, A3, C1, D1
3	3	0	A1,A3, B1,C1	**Cloud Physical Layer:** Considerations for designing cloud physical layer	Lecture	Assignment 2 2%
4	3	0	A1,B2, D2,D4	**Cloud Physical Layer (cont.):** Compute system Software Deployment on Compute Systems Types of Compute Systems	Software Demonstration, Group Discussion	-
5	3	0	A1,A3, B1,C1	**Cloud Physical Layer(cont.):** Storage System Considerations Network System Considerations	Lecture	Test1 A1, B1, C1, D1
6	3	0	A1,B2, D2,D4	**Cloud Virtual Layer:** Preparations for Resource Pool Introducing Virtual Resources	Software Demonstration, Group Discussion	Assignment 3 2% A2, A3, C1, D1
7	3	0	A1,A3, B1,C1	**Cloud Control Layer:** Types of Control Software Software-defined approach for managing IT resources in a cloud environment	Lecture	-
8	3	0	A1,B2, D1,D2, D4	**Cloud Control Layer (cont.):** Software defined Approach for managing cloud Resource Management Techniques	Software Demonstration, Group Discussion	-
9	3	0	A1, B1,C1, C2, D1	**Cloud Service Orchestration Layer:** Cloud Portal Interface Standards and Protocol	Lecture	Assignment 4 2% A2, A3, C1, D1
10	3	0	A1, C1, C2, D2	**Service Orchestration Layer (cont.):** Service orchestration Cloud Service Lifecycle	Lecture, Group Discussion	-
11	3	0	A1,A2 B2,C1, C2,D2	**Cloud Business Continuity:** Building Fault Tolerance Cloud Infrastructure	Lecture, Group Discussion	Test 2 A1, B1, C1, D1

12	3	0	A1,A2 B2,C1, C2,D2	**Cloud Business Continuity (cont.):** Data Protection Solution-Backup Data Protection Solution-Replication Application Resiliency for cloud	Lecture, Group Discussion	Assignment 5 2% A2, A3, C1, D1
13	3	0	A1,A2 B2,C1, C2,D2	**Cloud Security:** Cloud Security Threats Cloud Security Mechanisms	Lecture, Group Discussion	-
14 and 15	3	0	B2,D1, D2,D4	**Students Group Project** (Presentations and Reports)	Group Discussion	**Group Project Evaluation** B2,D1,D2,D4
16	2					**Final Exam** A1,B1,C1,C2, D1

Teaching Materials:

Textbook(s):	1. John Rhoton, CLOUD COMPUTING EXPLAINED :IMPLIMENTATION HANDBOOK FOR ENTERPRISES: 5th latest ED, 2013, 978-0956355607 2. John Rhoton, CLOUD COMPUTING PROTECTED : SECURITY ASSESSMENT HANDBOOK 5th LATEST ED, 2013, 978-0956355621
Handout(s):	Course notes and other teaching material available in **the course website in Moodle.**
Reference(s):	1. Michael Collier and Robin Shahan; "Fundamentals of Azure", Second Edition 2016. 2. Thomas Erl, Ricardo Puttini and Zaigham Mahmood; "Cloud Computing: Concepts, Technology & Architecture", the Prentice Hall Service Technology Series from Thomas, May 20, 2013. 3. EMC Corporation "Cloud Infrastructure and Services Version 2 Student Guide", 2014 Edition

Assessments:

Type of Assessment[1]	Description[2]	ILOs[3]	Weighting
Tests Test1: 5th Mar 2020 Test2: 28th April 2020	Two one hour Tests each 15 %. Test one cover topics from week 1 to week 5. Test two cover topics from week 6 to week 11.	A1, B1, C1	30%
Research Assignments: (Report)	Each student has to select a recently published article (within last 5 years) related to one of the specified cloud computing	A2, A3, C1, D1	10%

	topics and summarize, present, and discuss it in the class.		
Group Project: (Oral Presentation, Teamwork, and Report)	The class will be divided into groups, each group has to present a cloud solution proposal related treating specified technical problem.	B2, D1, D2, D4	20%
Final Exam:	Two-hour Final Exam consisting of essay questions. The exam will cover all the topics in the course syllabus.	A1, B1, C1, C2	40%

Overall	**100%**

Admissions	
Minimum number of students	**4**
Maximum number of students	**25**

Ahlia University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.ahlia.edu.bh/integrity **for more information).**

COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/SPECIFICATION

CODE & TITLE:	**ITCS 530: Bioinformatics Computing: (3-0-3)**
WEIGHT:	**(3-0-3)**
PREREQUISITE:	**Computer Programming skills**
NQF Level Allocated:	**5**
NQF Notional Hours / Credits:	**120**

DESCRIPTION:	Bioinformatics is the study of the structure and function of genes and proteins through the use of computational analysis, statistics, and pattern recognition and the use of databases, search and web-based interfaces to store, annotate and retrieve gene, protein and other information. This course focuses on the computing aspects of Bioinformatics. It introduces the broad frontiers of bioinformatics topics from fundamental algorithms to practical tools. Course topics include an overview of some bioinformatics resources, pattern matching, sequence alignment, gene prediction, fragment assembly, multiple alignment, phylogeny, statistical and machine learning approaches.

OBJECTIVES:	1. To overview the biology of bioinformatics
	2. To familiarize students with the principles and computational tools of contemporary bioinformatics
	3. To discuss the bioinformatics techniques used in real scientific problems.
	4. To learn about the algorithms and performance issues related to computational genomics.

SEMESTER:	Second	**ACADEMIC YEAR:**	2018/2019
INSTRUCTOR:	Dr. Ammar Sami Aldallal		
OFFICE TEL.:	17298999		
EMAIL:	aaldallal@ahlia.edu.bh		

INTENDED LEARNING OUTCOMES (ILOS)

A.	Knowledge and Understanding	NQF Descriptor/ Level
A1	Concepts and Theories: Demonstrate understanding of key concepts and theories of bioinformatics computing such as methods for storing, retrieving, organizing and analyzing biological data; and recognize how computer science algorithms and software tools are used to generate useful biological knowledge and help to discover new knowledge in genomics.	**Knowledge**: Theoretical understanding [Level 9]
A2	Contemporary Trends, Problems and Research: Demonstrate an informed and critical awareness of constraints, motivation, and challenges presented to computational scientists by contemporary biological research problems.	**Knowledge**: Theoretical Understanding [Level 9]
A3	Professional Responsibility: Demonstrate cognizance of, and adhere to the professional and legal standards of bioinformatics computing.	**Knowledge:** Theoretical Understanding. [Level 9]

B.	Subject-specific Skills	NQF Descriptor/ Level
B1	Problem Solving: Demonstrate skills in formulating adequate computational solutions to real bioinformatics problems.	**Knowledge**: Practical application [Level 9]
B2	Modeling and Design: Design, implement and verify programs to investigate biological phenomena.	**Skills**: Generic problem solving & Analytical Skills [Level 9] **Knowledge**: Practical application [Level 9]
B3	Application of Methods and Tools: Use specific computational techniques and software tools such as MATLAB or bioinformatics software (e. g, BioPython) in the analysis of biological data.	**Skills**: Communication, ICT and Numeracy [Level 9]

C.	Thinking Skills	NQF Descriptor/ Level
C1	Analytic: Analyze bioinformatics problems and propose suitable computational solutions.	**Skills**: Generic problem solving & Analytical Skills [Level 9]
C2	Synthetic: Assemble and present problem outcomes in a clear and logical manner.	**Skills**: Generic problem solving & Analytical Skills [Level 9]
C3	Creative: Identify and apply optimal computational solutions to given biological problems.	**Skills**: Informed judgements [Level 8]

D.	General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	Communication: Express and communicate ideas cogently, persuasively and effectively in written and oral form.	**Skills**: Communication, ICT and Numeracy [Level 9]
D2	Teamwork and Leadership: Work effectively as a member of a project team and demonstrate understanding of individual responsibility within the team.	**Competence**: Autonomy, Responsibility and Context [Level 9]
D3	Organizational and Developmental Skills: Organize ideas and allocate time efficiently in assigned tasks.	**Competence**: Autonomy, Responsibility and Context [Level 8]
D4	Ethical and Social Responsibility: Demonstrate understanding of, and adhere to, ethical and societal responsibilities in the field of bioinformatics computing.	**Knowledge**: Theoretical understanding [Level 9]

11. Course Structure

Week	Hours Lecture	Hours Lab	ILOs	Topics	Teaching Method	Assessment Method
1	3	-	A1, A2, A3	Introduction to Bioinformatics. Overview of Biochemistry and Molecular Biology	Lecture Discussion	Oral Enquiry* (A1)
2	3	-	A1,A2, A3,D1,D4	Introduction to the Genome, Information flow from the Genome , genes, DNA/RNA	Lecture Discussion	Oral Enquiry* (A1, D1)
3	3	-	A1, A2,A3,D1,D4	Web-based information systems Assignment of Group Project	Lecture Discussion	Oral Enquiry* (A1,D1) Assignment 1 (A1, A2,A3,D1,D4)
4	3	-	A1, B1, B2, B3, C1, D1	Bioinformatics programming and modeling Languages, Computational analysis tools Algorithms, Statistics, Hidden Markov models	Lecture Discussion Lab tutorial	Oral Enquiry* (A1,D1)
5	3	-	A1, B1,B2, B3,C1,D1	Data Mining, Pattern matching techniques	Lecture, Discussion Lab tutorial	Oral Enquiry* (A1,D1) Assignement 2 (B1,B2,B3,C1,D1)
6	3	-	A1,B1,B2, B3,C1	Databases and Data modeling, Search and Queries, Data warehouses	Lecture Lab tutorial	Oral Enquiry* (A1,D1)
7	3	-	A1,A2, A3, B1,B2, B3,C1,C2,D1	Data visualization	Lecture Lab tutorial	Oral Enquiry* (A1,D1) Assignment 3 (B1,B2,B3,C1,D1)
8-9	6	-	A1, A2, B1, B2,C1,C2,D1	Pairwise sequence Alignment BLAST and FASTA searching algorithms	Lecture	Midterm Exam (A1,B1,B2,C1,C2, D1) Oral Enquiry* (A1,D1)
10	3	-	A1, A2,B1,B2,B3,C1 ,D1	Multiple sequence alignments algorithms	Lecture Discussion Lab tutorial	Oral Enquiry* (A1,D1)
11	3	-	A1,B1,B2,B3,D1	Protein-protein interaction and networks, Hidden Markov model searches	Lecture Discussion	Oral Enquiry* (A1,D1) Assignment 4 (B1,B2,B3,D1)
12	3	-	A1, A2, A3, D1, D4	Protein comparisons, domains and protein families, Gene prediction	Lecture Discussion	Oral Enquiry* (A1,A2,A3,D1,D4)
13	3	-	A1, A2, B1, B2, B3,C1,D1	Genome sequencing and assembly Genome annotation: automated pipelines	Lecture Discussion Lab Tutorial	Oral Enquiry* (A1,D1)
14	3	-	A1, A2,B1, B2,B3, C1, C2,D1	Genome annotation: manual Genome comparison	Lecture Discussion Lab Tutorial	Oral Enquiry* (A1,D1)
15	3	-	B1,B2, B3, C1,C2,C3, D1,D2, D3,D4	Group Project Presentations by students		Evaluation of Group Project (B1,B2,B3,C1,C2, C3,D1,D2,D3,D4)
16	2			**Comprehensive Assessment**		**Final Exam**

TEACHING MATERIAL:

TEXTBOOK(S):   Miguel Rocha, Pedro G. Ferreira, Bioinformatics Algorithms: Design and Implementation in Python, 1st Edition, 1st edition, 2018, Academic Press

HANDOUT(S):   Lecture slides and notes
Other resources are available on the Course website (Moodle system)

REFERENCE(S):
1. Paul M. Selzer, Richard J. Marhöfer, Oliver Koch, Applied Bioinformatics: An Introduction 2nd ed. 2018, Springer.
2. Chandra Sekhar Mukhopadhyay, Ratan Kumar Choudhary, Mir Asif Iquebal, Basic Applied Bioinformatics, 2017, Wiley Blackwell.
3. Charles Malkoff, Bioinformatics, Proteomics and Genomics, Callisto Reference, 2017.
4. David W. Mount, "Bioinformatics sequence and Genom Alanysis", Cold Spring Laboratory Press, 2016.
5. David J. Barnes, D. Chu, *Introduction to Modeling for Biosciences,* Springer, 2010
6. Larry Hunter , *The Processes of Life: An Introduction to Molecular Biology*, MIT Press, 2009
7. *Journal of Bioinformatics and Computational Biology,* Publisher: World Scientific, Imperial College Press.
8. *BMC Bioinformatics,* Publisher: Jo Appleford-Cook, BioMed Cenral
9. *BioData Mining,* Publisher: BioMed Cenral
10. *Cognitive Computation,* Publisher: Springer US
11. *Bioinformatics,* Publisher: Oxford University Press
12. More references are available in **the course website in Moodle.**

ASSESSMENTS:

Type of Assessment[1]	Description[2]	Learning Outcomes[3]	Weighting
Assignment 1 *Assignment 2* *Assignment 3* *Assignment 4*	*Each assignment consists of a set of theoretical exercises related to the material covered in class (Assignment 1), in addition to programming questions where the student is required to write a program to implement bioinformatics algorithms discussed in class.* *Assignments must be handed in electronically or uploaded on the Moodle system on the due date. The assignments will be made available on the course website on the Moodle system.*	Assignment 1: A1,A2,A3,D1 Assignment 2 : B1,B2,B3,C1,D1 Assignment 3 : B1,B2,B3,C1,D1 Assignment 4 : B1,B2,B3,D1	$4 \times 5\%$
Midterm Exam	*The Midterm Exam is close book of one hour and 30 min duration, and consists of problem solving-based and short answer questions (SAQs).*	A1,B1,B2,B3,C1,C2	20 %
Group Project evaluation	*A project is assigned in the 3rd week of the semester where the students have to write a paper about one of the topics related to what is covered in the class. Students are recommended to contact the instructor to discuss any problems they may encounter.*	B1,B2, B3, C1,C2,C3, D1,D2, D3,D4	15 % + 5% presentation

	In the final week, each student is required to make a presentation of his/her project. Presentations are evaluated according to a specific marking rubric.		
Final examination	The final exam is of two hours duration and consists of Multiple Choice Questions (MCQs) and problem solving-based short answer questions (SAQs) .	A1, A3, B1,B2, C1,C2	40%
Oral enquiry	Questions are asked continuously throughout the course to assess student understanding in the different topics covered in class.	A1,A2,A3,D1	Formative Assessment
		Overall:	**100%**

[1] *For approved types of assessment (e.g. quiz, exam, project, etc.) see the ILO-Assessment Matrix in page 9 of Assessment Manual Version 2.0*

[2] As *a minimum provide the description should provide details of type of tasks to be completed and duration (if appropriate)*

[3] *The learning outcomes should be taken from the weekly schedule. Ensure that the assessment type and the learning outcomes are aligned as per the ILO-Assessment Matrix in page 9 of Assessment Manual Version 2.0*

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COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF IT

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: **ITCS 550 – Research Methods and Modeling**

Weight: **(3-0-3)**

Prerequisite: **Successful completion of at least 9 credits**

NQF Level Allocated: **9**

NQF Notional Hours / Credits: **120 notional hours/ 12 NQF credit**

Description: The course provides knowledge and skills in useful qualitative and quantitative research methods with the aim of enabling Master students to carry out their independent research and to execute and plan their research projects in IT and Computer Science. Particular focus of the course is to enable students to independently do literature review, to formulate their research problem, to conceptualize their research design and to write their final report. It also familiarizes students with Ahlia University guidelines for Master dissertation.

Objective:

1. To introduce various types of research techniques in IT and Computer Science

2. To explain how to formulate a research problem and conceptualize an appropriate research design

3. To demonstrate how to apply research ethics including perils of plagiarism and importance of acknowledging other people's work and proper way of referencing

4. To explain various qualitative and quantitative research methods used in IT and Computer Science

5. To encourage students to develop their independent research proposals.

6. To encourage students to conduct independent research in the field of IT and Computer Science

Semester: 2nd 2018-2019

Instructor (s): Dr. Sohail Safdar

Office Telephone: EXT: 8698   **Email (s):** ssafdar@ahlia.edu.bh

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate knowledge and understanding of concepts and theories of quantitative and qualitative research methods as applied in Information Technology (IT) and Computer Science.	Knowledge: theoretical understanding [Level 9]
A2	**Contemporary Trends, Problems and Research:** Understand contemporary trends and best practices of research in the field of Information Technology (IT) and Computer Science.	Knowledge: theoretical understanding [Level 9]
A3	**Professional Responsibility:** Demonstrate cognizance of, and adhere to, the professional and legal standards of research in IT and Computer Science and develop continuing awareness of best practices used in the production and publication of research work in these areas.	Knowledge: theoretical understanding [Level 9]

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Solve quantitative problems encountered in IT and Computer Science research (formulating/testing hypos).	Knowledge: Practical Application [Level 9] Skills: Communication, ICT & Numeracy [Level 9]
B2	**Modeling and Design:** Conceptualize and apply qualitative and quantitative research designs in IT and Computer science.	Generic problem solving and analytical skills [Level 9] Knowledge- Practical application [level 9]
B3	**Application of Methods and Tools:** Employ methods of data gathering and apply tools (software) applicable to and encountered in practical problems of research in various areas of interest.	Generic problem solving and analytical skills [Level 9]

		Knowledge – Practical application [Level 9] Communication, ICT and Numeracy Skills [Level 9]

C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic skills:** Evaluate real world research problems in conceptual terms; identify the appropriate research and computational methods (input) needed to solve them and analyze the output accordingly generated using quantitative or qualitative techniques.	Generic problem solving and analytical skills [Level 9]
C2	**Synthetic:** Integrate various research findings to generate coherent conclusions and recommendations to achieve long-term objectives and demonstrate the complex issues and problems in Information Technology (IT) and Computer Science.	Generic problem solving and analytical skills [Level 9]
C3	**Creative:** Utilize outcomes of research to generate new and novel research questions in the field of IT and computer science.	Generic problem solving and analytical skills [Level 9] Competence: Autonomy, Responsibility and Context [Level 9]

D. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:** Effectively communicate in written and oral form, and using technical and non-technical language, to present the outcomes of research findings in written and oral form clearly and successfully.	Communication, ICT and Numeracy Skills [Level 9]
D3	**Organizational and Developmental Skills:** Engage in life-long learning and continuing self-development to hone professional and organizational skills required in IT and Computer Science research.	Competence: Autonomy, Responsibility and Context [level 9]
D4	**Ethical and Social Responsibility:** Recognize, value, and demonstrate current ethics as applied to research in technical fields and social issues likely to be encountered in current use of Information Technology (IT) and Computer Science.	Competence: Autonomy, Responsibility and Context [Level 9]

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	3	-	A1, A2	**Types of Research** Types of Research – Application Perspective, Objective Perspective, Mode of Enquiry perspective	Lecture, Class discussions	To be covered in Interim Project
2	3	-	A2	**Formulating a Research Problem** Literature Review, Research Objectives	Lecture, Class discussions	To be covered in Interim Project
3	3	-	A1,B1, C1	Identifying Study Population, Identifying Variables, Constructing Hypotheses	Lecture, Class discussions	To be covered in Interim Project
4	3	-	A1,A2,B 1	**Conceptualizing a Research Design** Meaning of Research Design, Important Functions of Research Design, Study Designs in Qualitative and Quantitative Research	Lecture, Presentation, Oral Inquiry, Class discussions	To be covered in Interim Project
5	3	-	A1, A2, B1	**Construction of Tools/Instruments of Research** Methods of Data Collection, Attitudinal Scales, Measurement Scales, Validity and Reliability	Lecture, Presentation, Oral Inquiry, Class discussions in Group	To be covered in final Project
6	3	-	A2,D1	**Writing a Research Proposal** Stating the Problem, Objectives of the Study, Hypotheses to be Tested	Lecture, Presentation, Oral Inquiry, Class discussions in Group	To be covered in final Project

7	3	-	A2,D1	**Writing a Research Proposal continued** University Guidelines for Master Dissertation	Lecture, Presentation, Oral Inquiry, class discussions in Group	To be covered in final Project
8	3	-	A1,B1	**Selecting an Appropriate Sample Size** Concept of Sampling, Methods of Sampling, Calculation of Sample Size	Lecture, Class discussions	To be covered in final Project/ Major Exam
9	3	-	A2, A3, D4	**Research Ethics** Ethical Issues Including Perils of Plagiarism, Acknowledging Other Peoples' Work, Proper Ways of Referencing.	Lecture, Class discussions	To be covered in final Project/ Major Exam
10	3	-	A1,B1,C 1,C2	**Quantitative Research Methods** Estimation, Confidence Intervals, Construction of the Null Hypothesis and the Alternative Hypothesis	Lecture, Presentation, Oral Inquiry, Class discussions	To be covered in final Project / Major Exam
11	3	-	A1,B1,B 3,C1	**Quantitative Research Methods Continued** ANOVA, Linear Regression and Correlation, Using Some Important Software including Excel and SPSS	Lab session and software demo, Class discussions	To be covered in final Project/ Major Exam
12	3	-	A1,B1,B 3, C1,C2	**Quantitative Research Methods Continued** Multiple Linear Regression and Correlation, Using Some Important Software including Excel and SPSS	Lab session and software demo, Class discussions	To be covered in final Project/ Major Exam
13	3	-	A2, C1	**Report Writing** Interpretation of Results, Conclusions, Limitations of	Lecture, Presentation, Oral	To be covered in final Project

				Study, Suggestions for Further Research	Inquiry, Class discussions	
14	3	-	A2, A3, C3, D3	**Report Writing Continued** University Guidelines for Writing Master Dissertation	Lecture, Presentation, Oral Inquiry, Class discussions	To be covered in final Project
15	3	-	A1, A2, B1, C1	**Presentations**	Discussion	Evaluation of Interim Project
16	2		A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D3, D4	**Presentations**		**Final Project**

* Formative assessment

Teaching Materials:

Textbook(s):	1- Ranjit Kumar, *Research Methodology – A Step by Step Guide for Beginners,* 5th Edition, SAGE, 2019, **ISBN-1O:** 1526449900, **ISBN-13:** 978-1526449900 2- John W. Creswell, J. David Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches Fifth Edition, SAGE Publications, Inc, 2018, ISBN: 1506386709.
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Manuel Mora, *Research Methodologies, Innovations and Philosophies in* Software Systems, Engineering and Information, IGI Global, 2012. 2. Monique Hennink, Inge Hutter and Ajay Bailley, *Qualitative Research Methods,* SAGE, 2011. ISBN: 9781412922265. 3. C. R. Kothari, *Research Methodology: Methods and Techniques,* 2nd Edition, New Age International, , ISBN: 81224125223 4. Martin S. Olivier, , *Information Technology Research – A Practical Guide for Computer Science and Informatics,* 3rd Edition, Van Schaik, 2009, ISBN: 9780627027581.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Major Exam	Written exam to assess student skills in research ethics, and methods.	A1, B1, B2, C1	20 %
Project 1	On topics covered in weeks 1-4	A1, A2, B1, C1	20 %
Project 2	A comprehensive research proposal describing the prospective research components eligible for a Masters level	A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D3, D4	60 %
Overall:			**100 %**

Project 1

Requirements:

Choose an academic article and produce a critical summary that is no more than 1200 words. The article should be recent i.e. published after 2009. Your summary can be based on answering the questions given the section below (where appropriate). Please do not write just a list of answers. It is important to provide a cohesive summary that has within it the answers.

Summary contents (questions you should answer about the paper):

Research problem formulation

Is the research problem sufficiently important? Is it likely to produce new or useful information? Is the problem complex? Are prior theory and (if there) empirical work explained clearly? Are the outcomes stated clearly? Are the outcomes justified?

Literature Review

Does the investigator demonstrate familiarity with pertinent literature? Is the literature review comprehensive and well organised putting forward clearly the concepts/frameworks the author aims to explore?

Methodology

Is the chosen methodology appropriate to address the main research question? Are there too many variables included? Is the description of the research design sufficiently clear and specific

to permit rigorous evaluation? Does the author demonstrate familiarity with relevant methodological literature and techniques? Is the data suitable to the research objective?

Data Collection

Are data collection plans realistic? Do they raise ethical issues? Are plans offered for ruling out alternative explanations for results?

Findings

Does the investigator summarise the findings in a concise manner? Are the findings well-articulated and discussed within the literature?

Recommendations

Does the investigator offer recommendations for further research and are they justified adequately? Does the investigator suggest policy recommendations based on the findings? Are they well argued?

MARKING SCHEME

Grade Requirements	Grade
Pass (C): The student has summarised the article in a sway that can be understood by the reader without the need to read the original article itself. The student attempted to criticise the article in most of the areas that has been suggested. Also the student is using comparative purposes some of the literature that has been found from the article's references.	Grade C
Very Good (B): gives a well written summary based on an article from a good quality journal. Evidence of further reading is provided. The student has reflected and dealt with many of the issues/suggestions provided with the assignment.	Grade B
Excellent (A): gives an extremely well written summary based on an article from a top rated journal. Evidence of further reading is provided i.e. papers that have been read after the publication of the article used for the assignment. The student has reflected and dealt with most of the issues/suggestions provided with the assignment.	Grade A
Failure to meet the requirements in of C	Other

Project 2

Background

You will illustrate the problem which your research will be addressing, explain its academic and industrial context, demonstrate a knowledge and understanding of past and current work in the subject area by synthesising (analysing) at least 5 academic references of relevance to your work.

[the first paragraph will usually introduce the general area of the project]

[the next paragraph(s) will describe some previous work in this area; where you reference previous research use the format "Jones and Bloggs (1999) argued…" or "it has been found that…(Patel, 2002)", i.e. only author surname(s) and date should appear here - full details of the reference appear in the reference list (see below)]

[the final paragraph will present a problem which the discussion of previous work suggests is still unsolved - this should be the problem or question your project will address]

Aims and Objectives

In this section you should define the overall aim of the project and the specific measurable objectives that you plan to achieve. You should phrase your objectives in a way that once achieved they will demonstrate the successful achievement of the overall project's aim.

[the aim(s) should be general and broad; often it/they can be phrased in terms of solving a practical problem, answering a question or improving a business in some way; stick to one general aim]

[the objectives should be specific and measurable; the sum of your objectives should equal the achievement of the aim(s); it should be possible for you to evaluate your project by assessing whether it has met the objectives]

Methodological Approach

This should include some information on the general methodological approach you intend to adopt for your study, the accessibility of the data you intend to collect and the techniques you intend to use for data collection and data analysis.

[your project involves producing a solution to a practical problem, the method is the procedure you follow to come up with this solution; often the method will involve some form of interaction with potential participants (e.g. interviews, surveys, case studies, experiments, observations), the analysis of which should inform the solution design; for some projects the method may involve analysis of existing data to inform the solution (examples might include a conceptual analysis based on what others have written, a statistical analysis using an existing data set, or a structured analysis of an existing published data set); try to give a good justification as to why the method you have chosen is suitable for your problem]

[you will most likely want to base your actual methodological approach around an established business and social sciences methodology - you can mention this here but try to keep it brief; if you have chosen a particular methodology just say which one with a brief justification; if you have yet to choose a methodology then mention the candidates and how you intend to choose between them]

Programme of Work

In this section you should describe the tasks you need to conduct in order to complete the project, identify the major milestones by which you and your supervisor will monitor the progress of your project (e.g. completion of literature review, completion of data collection). The programme of work should be illustrated by a simple diagrammatic work plan showing the major tasks and milestones against a timeline. The work plan is not included in the words limit of the detailed research proposal and represents a one-page 'appendix' to this report.

[the general format of this section is illustrated below:

Task 1: task title (estimated effort N weeks)

[brief description of the task]

Milestone 1: milestone name

[together the tasks you perform should allow you to meet your stated objectives - you may find it helpful to refer to these in writing the task descriptions]

References

At least 5 academic references relevant to your research proposal using the Harvard style.

[provide an alphabetical list, ordered by first author surname, of all references you cite in the text of this report; the accepted format style for referencing is the Harvard style - search on Google for "Harvard referencing" to find lots of useful resources on how to do this]

[you can adapt the table below to show your own plan; it is fine if you wish to use project planning software to develop your plan, however you must produce a version which can be inserted into the word document which you submit electronically for part 2]

Task Id	Task Name	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9….	Wk n
1	Project Planning	▓	▓	▓	◆						
2	Library Work	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
3	Planning Survey					▓	◆				
4	Data Collection							▓	▓	◆	

5…											

◆

= milestone

▢ = key task

MARKING SCHEME

Grade Requirements	Grade
Pass (C): A coherent response to the requirements of the assessment task: the report's overall structure and writing quality is adequate; the reference list is complete (and organised alphabetically in Harvard format); the word limit is not exceeded; evidence of accurate restatement and organisation of relevant concepts, methodology and material appropriate to writing a short report for the lay person. Clarity of the problem statement and the implementation of the method used.	Grade C
Very Good (B): The requirements for a grade C are met. In addition: • Demonstrates skills in organising, presenting and interpreting knowledge from the relevant sources; • Explains the general merits and demerits of any material reviewed; • Is neatly formatted with few typographical or grammatical errors; • Demonstrates a confident level of understanding based on an assured grasp of relevant concepts, methodology and content appropriate to writing a short report. • Evidence of significant skill in interpreting complex material articulated with a high level of competence. • Provide good justifications of the steps followed in selecting, implementing and experimenting with the researched concept.	Grade B
Excellent (A): The requirements for a grade B are met. In addition: • Provide excellent and convincing justifications of the steps followed in selecting, implementing and experimenting with the method used. • Demonstrates excellent skills in interpreting lay information and converting them into a theoretical model. • Demonstrates evidence of a consistently authoritative grasp of concepts, methodology and content appropriate to writing a report, with evidence of depth and confidence in the understanding of issues underpinning the assessment task.	Grade A
Failure to meet the requirements of C	Other

Admissions	
Pre-requisites	**Successful completion of at least 9 credits**
Minimum number of students	**8**
Maximum number of students	**20**

Ahlia University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.ahlia.edu.bh/integrity **for more information).**

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF MULTIMEDIA SCIENCE

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title:	**ITMS 523 – Multimedia Information Systems**
Weight:	**(3-0-3)**
Prerequisite:	**None**
NQF Level Allocated:	**9**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

Description: This course constitutes an approach to multimedia information systems that are concerned with the capture, storage and presentation of information in a variety of forms, including text, image, video and audio. It presents a general overview of electronic multimedia documents, a deep coverage of XML and XML Databases with particular focus on: (1) developing skills in the design and management of multimedia information systems projects; (2) employing evaluation techniques for multimedia authoring systems and multimedia user interfaces; and (3) developing an understanding of the current state of multimedia applications and their impact on organizations

Objective:

1. To provide a detailed overview of Electronic Documents including Multimedia Documents.
2. To explain how to create and manage XML documents
3. To demonstrate how to validate XML documents with DTD and XML Schema
4. To explain how to design, populate and query XML Databases

Semester:	**First 2019-2020**
Instructor (s):	**Dr. Karim Hadjar**
Office Telephone:	**17298974** **Email (s): khajjar@ahlia.edu.bh**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate knowledge and understanding of general concepts and techniques of multimedia information systems, especially those related to XML, the different types of validation of XML documents and XML Databases by considering Multimedia Documents.	Knowledge: theoretical understanding [Level 9]
A2	**Contemporary Trends, Problems and Research:** Demonstrate critical awareness of contemporary trends, issues and problems in multimedia information systems particularly with respect to the need for XML documents and XML Databases.	Knowledge: theoretical understanding [Level 9]
A3	**Professional Responsibility:** Demonstrate an awareness of professional ethics and responsibilities related to the multimedia information systems and XML Databases through case studies dealing with Multimedia and real life examples	Knowledge: theoretical understanding [Level 9]

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Develop, manipulate and process efficiently various Multimedia Documents having in mind the different efficient designs techniques explored through research	Skills: Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical Understanding [Level 9]
B2	**Modeling and Design:** Design the architecture of Multimedia Information Systems through the means of XML Documents having in mind the different designs of multimedia information systems-based (XML Databases and electronic documents including Multimedia Documents) explored through research.	Skills: Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical Understanding [Level 9]

B3	**Application of Methods and Tools:** Use and apply appropriate multimedia tools such as ALTOVA XML SPY to develop and manipulate multimedia documents and create Multimedia Information Systems through the means of electronic documents and Native XML Databases (NxD)	Skills: Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical Understanding [Level 9]

	C. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Analyze cases of XML Document and XML Databases dealing with Multimedia with respect to their nature (qualitative analysis) or proportions (quantitative analysis), in order to identify the best possible alternatives/decisions	Generic cognitive skills [Level 9]
C2	**Synthetic:** Align decision-making with strategic objectives in order to select the best possible alternatives as regards cases of XML Document and XML Databases dealing with Multimedia	Generic cognitive skills [Level 9]
C3	**Creative Thinking and innovation:** Demonstrate originality and creativity in relation to the development of efficient multimedia information systems such as XML Document and XML Databases	Knowledge: Practical Understanding [Level 9]

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Express and communicate ideas effectively, in written and oral form to colleagues and/or instructor as appropriate, regarding the skills of multimedia information systems such as XML Document and XML Databases	Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a team of technical people who may plan, design, implement, manage, and monitor a project	Competence: Autonomy & Responsibility [Level 9]

		Competence: Learning to learn [Level 9]
D3	**Organizational and Developmental Skills:** Engage in life-long learning and continuing self-development to hone professional and organizational skills. Assimilate effective work habits including but not limited to time management.	Competence: Autonomy & Responsibility (Level 9) Competence: Learning to learn [Level 9]
D4	**Ethics and Social Responsibility:** Recognize, accept, and follow ethical and social responsibility and respond positively to the needs of society by identifying, employing and utilizing effectively the advanced computing and information solutions and technologies	Competence: Autonomy & Responsibility (Level 9)

Course Structure (Outline)

<table>
<tr><th colspan="6">Course Structure (Outline)</th></tr>
<tr><th>Week</th><th>Hours</th><th>ILOs</th><th>Unit/Module or Topic Title</th><th>Teaching Method</th><th>Assessment Method</th></tr>
<tr><td>1</td><td>3</td><td>A1,D4</td><td>Introduction and Electronic Documents including Multimedia Documents</td><td>Lecture</td><td>Oral Participation (A1)</td></tr>
<tr><td>2</td><td>3</td><td>A1, B1, B3, D1</td><td>XML part 1</td><td>Lecture/ Lab session demo</td><td>Oral Participation (A1, D1)</td></tr>
<tr><td>3</td><td>3</td><td>A1, B2, B3, C2, D1</td><td>Modeling XML Documents</td><td>Lecture, Exercises</td><td>Oral Participation (A1, C2)</td></tr>
<tr><td>4</td><td>3</td><td>A1,B1, B3</td><td>XML part 2</td><td>Lecture/ Lab session demo, Exercises</td><td>Oral Participation (A1,D1)</td></tr>
<tr><td>5</td><td>3</td><td>A1, B2, B3, C2, D1</td><td>Modeling Complex XML Documents by considering Multimedia Documents</td><td>Lectures</td><td>Oral Participation (A1, C2)</td></tr>
</table>

6	3	A1, B1, B2, B3, C1, C2, D1,D3	Validating XML Documents with DTD	Lecture, Exercises	Oral Participation (A1,C1) /**Research Assignment 1** (A1, B1, B2, B3, C1, C2,D1, D3)
7	3	A1,B2,B3	XML Schema part 1	Lecture/ Lab session demo	Oral Participation (A1)
8	3	A1, B1, B2, B3	XML Schema part 2	Lecture/ Lab session demo, Exercises	Oral Participation (A1)
9	3	A1, B1, B2, B3, C1, C2, D1	XML Schema part 3	Lecture/ Lab session demo, Exercises	**Midterm Exam** (A1, B1, B2, B3, C1, C2) Oral Participation (A1)
10	3	A1, B1, B3, C1	Validating XML Documents with XML Schema	Lecture, Exercises	Oral Participation (A1, C1)
11	3	A1, A3, B1, B3, C1	XML Databases part 1	Lecture/ Lab session demo/ Case study	Oral Participation (A1, A3)
12	3	A1, A3, B1, B2, B3, C1, C2, D1,D3	XPATH	Lecture, Exercises	Oral Participation (A1, D1)/ **Research Assignment 2** (A1, A3, B1, B2, B3, C1, C2, D1,D3)
13	3	A1, A3, B1, B2, B3, C1, C3	XML Databases part 2 and XQUERY	Lecture/ Lab session demo, Exercises	Oral Participation (A1)
14	3	A1, A2, A3, B1, B2, B3, C1, C3	More on XML Databases and XQUERY and how to model and write them when dealing with Multimedia Documents	Lecture/ Lab session demo, Exercises	Oral Participation (A1)
15	3	A1, A2, A3, B1, B2, B3, C1, C2,C3,	Student reports and presentations of team research projects	Student presentation	**Evaluation of Project Presentations & Reports** (A1, A2, A3, B1, B2, B3, C1, C2,C3,

		D1,D2,D3, D4			D1,D2,D3, D4)
16	2				**Final Exam** **(** A1, A2, A3, B1, B2, B3, C1, C2,C3**)**

* Formative assessment

Teaching Materials:

Textbook(s):	Herong Yang, *XML Tutorials – Herong's Tutorials Examples*, Independently published, 2018
Handout(s):	Power point slides, http://www.ahlia.edu.bh/moodle.
Reference(s):	1- E. R. Harold and W. Scott Means, *XML in a Nutshell: A Desktop Quick Reference*, 3rd Ed., O'Reilly Media, 2004 2- K. H. Goldberg, *XML: Visual QuickStart Guide*, 2nd Ed., Peachpit Press, 2008. 3- E. T. Ray, *Learning XML*, 2nd Ed., O'Reilly Media, 2003. **4-** E. R. Harold, *Effective XML: 50 Specific Ways to Improve Your XML,* Addison-Wesley Professional 2003

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Research Assignment 1	The assignment consists of essay, problem-solving and research based theoretical questions covering topics studied in the first 6 weeks. The purpose of the assignment is to assess students individually where they have to demonstrate their extensive and detailed knowledge and critical awareness of current research, trends and advancements in multimedia information systems. The assignment will also assess students' skills in using and applying appropriate multimedia tools such as ALTOVA XML SPY to develop and manipulate multimedia	A1, B1, B2, B3, C1, C2, D1, D3	10%

	documents and create Multimedia Information Systems through the means of electronic documents and Native XML Databases (NxD). Soft copy submission is required by the end of the 7th week through the course page in Moodle where answers will be checked by Turnitin against plagiarism. Any implementation code developed during this assignment will have to be submitted also electronically to be tested and evaluated.		
Research Assignment 2	Same as assignment 1 but the topics will cover up to week 12. Students will be also asked to analyze cases of XML Documents including Multimedia Documents and XML Databases with respect to their nature or proportions in order to identify the best possible alternatives/decisions. Soft copy submission is required by the end of the 13th week through the course page in Moodle where answers will be checked by Turnitin against plagiarism. Any implementation code developed during this assignment will have to be submitted also electronically to be tested and evaluated.	A1, A3, B1, B2, B3, C1, C2, D1,D3	10%
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures and lab sessions. Feedback will be given to students to reaffirm their learning outcomes.	A1, A3, C1, C2, D1	Formative
Midterm Exam	The midterm exam will be an in-class 1-hour exam that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 9 weeks. Students will be asked to design and write some XML code for developing and manipulating multimedia documents.	A1, B1, B2, B3, C1, C2	20%
Team Research Project (Report and Presentation)	Starting from weak 4, the class will be divided into teams of 4-5 students where each team will be asked to study a research problem in multimedia information systems utilizing the knowledge, skills and tools learned in class. Teams are required to plan and execute the research project that must involve a main component of multimedia tools application using such as ALTOVA XML SPY to develop and manipulate multimedia documents and create Multimedia Information Systems through the means of electronic documents including Multimedia Documents and Native XML Databases (NxD). In the final week, each team will have to submit their research report (worth 14%) explaining the research problem, research methods used, analysis and the conclusion highlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation (worth 6%)	A1, A2, A3, B1, B2, B3, C1, C2,C3, D1,D2,D3, D4	20%

	summarizing the research conducted and its findings. Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.		
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions. Students will be asked to design and write XML code for some component of multimedia information systems which includes Multimedia Documents.	A1, A2, A3, B1, B2, B3, C1, C2,C3	40%
Overall:			**100 %**

Admissions	
Pre-requisites	None
Minimum number of students	**4**
Maximum number of students	**20**