COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF IT

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

Course Code & Title:	**ETHC 392 – Ethics and Professional Practice in IT and Engineering**
Weight:	**(3-0-3)**
Prerequisite:	**Completing at least 66 Credits**
NQF Level Allocated:	**7**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

Description: The course explores and discusses key ethical, legal and professional issues and responsibilities in Computing and other related fields. It examines emergent technologies within frameworks that highlight their ethical, legal and social implications. Topics include privacy, confidentiality, security, intellectual property, software piracy, cybercrime, digital identity, software reliability, risk and safety and professional standards of conduct and codes of ethics. The students critically examine current and relevant research and particular case studies to enhance their understanding of the subject. The students learn that careers in IT and Computer Engineering are not purely technical professions but ones with moral, legal and social implications that impact the everyday lives of professionals.

Objective:

1. To review and apply ethical concepts, frameworks and analysis tools to identify and evaluate ethical choices within the computer-related professions.
2. To explore various ethical and legal issues and controversies commonly faced by computing professionals and their impacts on society.
3. To examine some of the relevant professional code of ethics and code of conduct.
4. To highlight the importance of professional and social responsibilities for computing professionals.

Semester:

Instructor (s):

Office Telephone: EXT: Email (s):

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Present advanced knowledge and understanding of ethical, social and legal concepts that relate to the Computing professions.	Knowledge: theoretical understanding [Level 7]
A2	**Contemporary Trends, Problems and Research:** Identify, describe and discuss controversies arising in the computing related fields including intellectual property, privacy and cybercrime, professional and social responsibilities, legal accountability, responsibility and liability.	Knowledge: theoretical understanding [Level 7]
A3	**Professional Responsibility:** Demonstrate the ability to examine and apply the code of ethics and the codes of conduct in relation to IT and computing professions.	Knowledge: theoretical understanding [Level 7] Knowledge: practical application [Level 7]

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Inspect, analyze, and investigate ethical behavior in real-life IT and computing business environments through critical thinking and examination of IT and computing-related ethical codes of conduct.	Knowledge: practical application [Level 7] Generic problem solving and analytical skills [Level 7]
B2	**Modeling and Design: N/A**	
B3	**Application of Methods and Tools: N/A**	

	C. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Identify, analyze, and justify the ethical, legal and social ramifications and implications of certain actions within the computing related fields.	Generic Problem Solving & Analytical skills [Level 7]
C2	**Synthetic:** Formulate and justify ethical decisions taken when examining and analyzing certain behaviors within the computing professions and in the delivery of services.	Generic Problem Solving & Analytical skills [Level 7]
C3	**Creative:** Demonstrate originality in the creation of solutions to ethical dilemmas that arise in the computing profession.	Generic Problem Solving & Analytical skills [Level 7]

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Share ideas and knowledge relating to the computing profession and the delivery of its services effectively, in both oral and written form.	Communication, ICT and Numeracy Skills [Level 7]
D2	**Teamwork and Leadership:** Develop an experience of leadership and teamwork.	Competence: Autonomy, Responsibility and Context [Level 7]
D3	**Organizational and Developmental Skills:** Value the role of life-long learning and professional development in maintaining professional behavior and up-to-date knowledge on ethical, legal and professional issues.	Competence: Autonomy, Responsibility and Context [Level 7]
D4	**Ethical and Social Responsibility:** Value and embrace ethically and socially responsible behavior in the profession of computing and the delivery of its services.	Competence: Autonomy, Responsibility and Context [Level 7]

Course Structure (Outline)

Week	Hours Lec.	Hours Lab	ILOs	Topics	Teaching Method	Assessment Method
1-2	6	-	A1	**Overview:** Introduction, ethical concepts, theories, perspectives and frameworks, moral philosophy and critical thinking skills needed to establish and justify a moral system.	Lecture/ Class Discussion	Quiz1
3-4	6	-	A1, B1, C1, D1, D4	Definitions, methods and tools of analysis for identifying and evaluating ethical choices. Relationship between Computer engineering and IT codes of ethics, law, professionalism and their social implications. **Case Studies:** E-mail & Spam, the Cyber City Network	Lecture/ Debate/ Case studies	Quiz2 Assignment1
5	3	-	A1,A2,A3, B1, C1,C2	**Professionalism:** Ethical and social responsibilities. Loyalty and whistle-blowing, lifelong learning, professional development, relationships with professional societies, professional codes of conduct and codes of ethics, such as ACM, IEEE, BCS, AITP and ICCP.	Lecture/ Debate	Quiz2
6	3	-	A1, B1, C1,C2,C3, D1,D2,D3,D4	**Workplace issues:** Harassment, discrimination, system use policies, monitoring, surveillance.	Lecture/ Class Discussion	Assignment2

7-8	6	-	A1,A2,A3, B1, C1,C2	**Privacy**, confidentiality and secrecy; monitoring, recording, tracking, intrusion and encryption. **Case Studies:** Wikileaks, Facebook	Lecture/ Debate/ Case studies	Assignment2
9-10	6	-	A1, B1, C1,C2	**Intellectual property** laws and rights, ownership of information, plagiarism, copyrights, patents, trademarks and trade secrets, software piracy, fair use, free and open source movement, Digital Millennium Copyright Act (DMCA), Non-Disclosure Agreements (NDAs). **Case Studies:** P2P Networks (Napster), Google Books	Lecture/ Class Discussion / Debate/ Case studies	Major Exam Quiz3
11-12	6	-	A1, A3, C1,C2	**Trust and Trustworthiness in Computer Engineering and IT**. Social responsibility, safety, reliability, assurance, security, risk within computer-based systems, computerized medicine. **Case Studies:** To Test or not to Test the Software	Lecture/ Debate / Case studies	Major Exam
13-14	6	-	A1,A2,A3, B1, C1,C2, C3, D1,D3,D4	**Legal Issues:** Legal liability and accountability, compliance, computer and cyber-related crimes, hacking/cracking, ethical hacking, piracy, trespassing, vandalism, community and identity in cyberspace, identify	Lecture/ Class Discussion /Debate/ Case studies	Assignment3

				theft, viruses, regulating commerce and speech, Censorship. **Case Studies:** US Children's Internet Protection Act		
15	3	-		Revision		
16	2	-	A1,A2,A3,B1, C1,C2	All Topics		Final Exam

* Formative assessment

Teaching Materials:

Textbook(s):	1. M. J. Quinn, Ethics for the Information Age, 7th Ed., Wiley, 2016.
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	**Books:** 1. George Reynolds, *Ethics in Information Technology*, Cengage Learning; 6 edition (January 1, 2018). ISBN: 978-1337405874 2. W. J. Brinkman and A. F. Sanders, *Ethics in a Computing Culture*, 1st Ed., 2013 3. Herman T. Tavani, *Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing*, Wiley, 5th Edition, 2015. 4. M. Quinn, *Ethics for the Information Age*, 6th ed., Pearson, 2015. 5. S. Baase, *A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet*, 3rd Ed., Prentice Hall 2008. 6. R. Spinello, *Cyberethics: Morality and Law in Cyberspace*, 4th Ed., Jones & Bartlett Publishers, 2010. 7. J. Rachels and S. Rachels, *The Right Thing to Do: Basic Readings in Moral Philosophy*, McGraw-Hill College; 6thEd., 2011. **Websites:** 1. *ACM Code of Ethics and Professional Conduct*, available at http://www.acm.org/about/code-of-ethics 2. *ACM/IEEE Software Engineering Code of Ethics and Professional Practice*, available at http://www.acm.org/about/se-code 3. *IEEE Code of Ethics*, available at http://www.ieee.org/about/ethics_code/index.html 4. *AITP Code of Ethics and Standards of Conduct*, available at http://c.ymcdn.com/sites/www.aitp.org/resource/resmgr/forms/code_of_ethics.p df 5. ICCP Code of Ethics, available at http://iccp.org/coe

6. *ACM Privacy Policy*, available at
   http://www.acm.org/about/privacy-policy
7. *Codes of Conduct/Practice/Ethics From Around The World*, available at http://courses.cs.vt.edu/cs3604/lib/WorldCodes/WorldCodes.html
8. *Engineering Ethics in Practice: A guide for Engineers*, available athttp://www.raeng.org.uk/societygov/engineeringethics/pdf/engineering_ethics_in_practice_short.pdf
9. *Ethics in Practice: A Practical Guide for Professional Engineers*, available at http://www.icac.org.hk/new_icac/files/cms/eng/12418pdf.pdf
10. *Ethics in Engineering,* available at https://www.asme.org/about-asme/get- involved/advocacy-government-relations/ethics-in-engineering
11. *Ethics Cases,* available at http://www.scu.edu/ethics/practicing/focusareas/cases.cfm
12. *Computer Ethics Links,* available at http://www.sigcas.org/ethics and maintained by ACM Special Interest Group on Computers and Society (SIGCAS).
13. *Online Ethics Center,* available at http://www.onlineethics.org/ and maintained by the National Academy of Engineering (NAE).

14. More references are available in the course website in Moodle.

Organizations:
1. IEEE Society on Social Implications of Technology (SSIT)
2. ACM Special Interest Group on Computers and Society (SIGCAS)
3. National Institute for Engineering Practice (NIEE)

Assessment

Assessment Method	Description	ILOs	Weight
Test	The Major Exam is a 1-hour in-class exam that consists of multiple choice, essay, and problem solving questions. It covers the topics studied in the first 8 weeks.	A1, A2, A3, B1, C1, C2	20%

Assignments	Three assignments are given to students; each is weighted 10 marks and all are summed up to a total of 30% of the student final mark. **Assignment 1:** Students are given some ethical scenarios and are asked to evaluate these scenarios and to suggest ethical solutions to them. Students are encouraged to come up with creative solutions to the ethical issues involved in these scenarios. **Assignment 2:** Students are divided into groups, each group is assigned a section of an article related to the latest issues/controversies in IT/Computer- Engineering ethics to summarize and present to their classmates. The article is included in the Course Material. **Assignment 3:** Role-playing can be a powerful learning experience and can, if used correctly, help stimulate lively discussion and debate among students. In this exercise, students are asked to take the part of a character in a case study that portrays a realistic, difficult ethical situation, students will be working in groups and along with the role-play students must provide a report containing the script, their roles as well as a list of the ethical problems. The goal of this exercise is that student will recall what they have learned through participating in this role play scenario and be able to apply what they learned to ethical problems they may encounter in their professional careers.	A1, A2, A3, B1, C1, C2, C3, D1, D2, D3, D4	30%
Quizzes	Five 30-minutes in-class quizzes are given to students; each is weighted 10 marks, out of which, only the best four quiz marks, for each student, are averaged to constitute the 10% mark assigned to quizzes. Each quiz consists of two questions; a multiple choice question and either a problem solving or essay question.	A1, B1, C1	10%
Final Exam	A two hours closed book final exam is given to students. It covers all materials taught in the course including the article given to students in Assignment 2. The final exam consists of multiple choice, short-answer, essay and problem-solving questions that encourage the development of creative solutions to the ethical issues/scenarios addressed in the exam.	A1, A2, A3, B1,C1, C2, C3	40%
Overall			**100%**

Admissions	
Minimum number of students	5
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).**

Course Code & Title: INTR463 – BSIT Internship

Weight: (0-0-3)

Prerequisite: Completion of at least 90 Credits and CGPA ≥ 2.0

NQF Level Allocated: 8

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

Description:

In today's turbulent economic environment, a country workforce is increasingly pivotal to business success. Stemmed from the desire and sense of responsibility that Ahlia University has against the society and their own students, and as part of their vision, of being leaders in the market of higher education, they do understand the need to invest in their capital made of partially their students in order to equip the market with talented workforce. Based on this INTR 463 course was introduced, representing a structured opportunity to incorporate academic, professional and personal skills development which enables the student to gain a planned and directed learning experience. It enables the student to integrate knowledge gained through their classroom learning with the competencies made available through actual experience in a professional setting. The internship programme requires a minimum of 240 hours of work at the internship worksite. Students will receive academic credit after a successful completion of the programme. The numbers of credits that are earned by the student as a result of successful completion of the internship programme are 3 credits.

Objective:

The BSIT Internship is a form of experiential learning and the aims are:

1. To provide students from the college with an opportunity to integrate knowledge, skills and competencies learned in the classroom with practical application and skills enhancement in an IT-related work-based/professional environment.
2. To give students an opportunity to gain experience of an IT- work environment and to develop links with professionals in the field they are considering for a future career
3. To ultimately enhance student employability and at the same time to build relationships between the university, businesses and the local community.
4. To give employers an opportunity to guide and also evaluate future talent in the field of IT: software development, networking, database management and web design.

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:**	N/A
A2	**Contemporary Trends, Problems and Research:**	N/A
A3	**Professional Responsibility:** Demonstrate awareness of business professional etiquette during the achievement of internship responsibilities including a holistic appreciation of day-to-day obligations as a practitioner in the field of IT.	Knowledge: Theoretical Understanding [Level 8] Knowledge: Practical Application [Level 8]
B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Solve practical real-world problems in an organization using computing techniques and algorithms.	Knowledge: Practical Application [Level 8] Skills: Generic Problem Solving and Analytical Skills [Level 8] Skills: Communication, ICT and Numeracy Skills [Level 8]
B2	**Modeling and Design:** Apply design skills in terms of: software component model, data model, and system–user interaction model.	Skills: Generic Problem Solving and Analytical Skills [Level 8] Skills: Communication, ICT and Numeracy Skills [Level 8]
B3	**Application of Methods and Tools:** Gain proficiency in	Knowledge:

			NQF Descriptor/ Level
		programming skills in: oracle, java, visual basic, web programming, O-O programming and/or scripting languages.	Practical Application [Level 8] Skills: Communication, ICT and Numeracy Skills [Level 8]
C.	**Critical-Thinking Skills**		**NQF Descriptor/ Level**
C1	**Analytic skills:** Apply skills of internal and external criticism, employ logic and, where appropriate, interpret output of crunched numeric data utile in a decision-making process in an IT-context.		Skills: Generic Problem Solving and Analytical Skills [Level 8] Skills: Communication, ICT and Numeracy Skills Level 8]
C2	**Synthetic:** Draw together information and, where relevant, output of analysis, to yield cogent conclusions in an IT-context.		Skills: Generic Problem Solving and Analytical Skills [Level 8] Skills: Communication, ICT and Numeracy Skills [Level 8]
C3	**Creative Thinking and innovation:** Think out of the box as an aid to generating innovative solutions in an IT-context.		Skills: Generic Problem Solving and Analytical Skills [Level 8] Skills: Communication, ICT and Numeracy Skills [Level 8]
D.	**General and Transferable Skills (other skills relevant to employability and personal development)**		**NQF Descriptor/ Level**
D1	**Communication:** Communicate effectively orally and written to a variety of stakeholders of the organization who manifest different levels of technical expertise and knowledge. Make IT information cognizable to non-IT professional and address technical issues to both technical and non-technical audiences.		Skills: Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:** Take part, where applicable, in designated team-work, shouldering burdens, as part of a team, which adds value to group output in the organization. Exercise initiative to support, encourage and contribute to the output of other team members fostering a positive team environment		Competence: Autonomy, Responsibility and Context

			[Level 8]
D3	**Organizational and Developmental Skills:** Demonstrate skills utile to keeping organized and meeting deadlines and develop a facility to learn on the job, such organizational skills may include storing and presenting data and the use of logical diagrams (flow charts, time-lines).		Competence: Autonomy, Responsibility and Context [Level 8]
D4	**Ethics and Social Responsibility:** Perform job functions in light of ethical and social norms in a way that contribute to the social responsibility of the organization.		Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)
NA

Teaching Materials: On job training and mentoring tasks supervision.

Handout(s):	Ahlia University Undergraduate Internship Programme Guidelines

Assessment

The student will be given grade PASS or FAIL based on his/her total points achieved on the undertaken Tasks. A letter grade P will be issued for the student if he/she obtained 70 points or more on the tasks shown above in the grading Scheme table and a letter grade F if he/she obtained less than 70 points.

Method of Assessment	Description	Learning Outcomes	Weighting
Site Supervisor Mid Evaluation	The site supervisor evaluates the student after the completion of the first month of the internship period and assesses the student personal qualities and professional skills. A 5-points scale is used to evaluate the student. The assessment is based on the quality of the work done, the attitude demonstrated by the student as well as the site supervisor continuous contact with the student and the academic supervisor during the internship period. The completed form is discussed with the student to help him/her in his/her professional development.	A3, B1, B2, B3 C1, C2, C3 D1, D2, D3, D4	25%

Site Supervisor Final Evaluation	The site supervisor evaluates the student after the completion of the internship period. The evaluation form consists of two parts. In the first part, a 5-points scale is used to evaluate the student personal qualities and professional skills. The second part of the evaluation consists of two questions concerning the student strengths and weaknesses as well as the site supervisor recommendations to prepare the student for the workplace. The assessment is based on the quality of the work done, the attitude demonstrated by the student as well as the site supervisor continuous contact with the student and the academic supervisor during the internship period. The completed form is discussed with the student to help him/her in his/her professional development.	A3, B1, B2, B3 C1, C2, C3 D1, D2, D3, D4		25%
Academic Supervisor Evaluation	The academic supervisor evaluates the student after the completion of the internship period and assesses the student personal qualities and professional skills. A 5-points scale is used to evaluate the student. The assessment is based on the two site visits conducted by the academic supervisor to the student as well as the academic supervisor continuous contact with the student and the site supervisor during the internship period. The completed form is discussed with the student to help him/her in his/her professional development.	A3, B1, B2, B3 C1, C2, C3 D1, D2, D3, D4		10%
Student Monthly Report 1	The first monthly report is completed by the student by the end of the first internship month. In the report, the student should answer four questions each answer must consist of at least 50 words typed in paragraph format.	D1, D3		10%
Student Monthly Report 2	The second monthly report is completed by the student by the end of the second internship month. In the report, the student should answer four questions each answer must consist of at least 50 words typed in paragraph format.	D1, D3		10%
Student Final	After the completion of the internship,	D1, D3		20%

Report	the student must write a final report reflecting on his/her internship experience with a brief description of the organization in which he/she spent the internship period. The report consists of a cover page, table of contents, overview, summary of accomplishment, problems faced and skills attained and an overall evaluation of the internship experience and recommendations for improvement.		
Overall:			**100 %**

Admissions	
Minimum number of students	**NA**
Maximum number of students	**NA**

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

Course Code & Title: ITCS 101 - Introduction to Computers and IT

Weight: (2 - 2 - 3)

Prerequisite: None

NQF Level Allocated: Level 6

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

Description: This course is an introduction to computer and information technology. It introduces computers (their uses, development, components, hardware and software) to the students and to teach them how to use MS Office.

Objective:

1. To provide an introduction to the basic concepts of computers and information processing.
2. To describe the set of programs that lies between application software and the computer hardware with its type.
3. To explain the job of the most important component in computer (CPU) that helps to run instruction in it.
4. To identify and describe the most important software for editing, storing, retrieving and printing data.
5. To explore the basic security threats and techniques to prevent them.
6. To create awareness of the basics of computers and the internet with emphasis on online information and service resources.
7. To recognize green techniques, equipment and processes
8. Gain facility in the use of Microsoft Office (WORD/EXCEL) leading to professional certification acquisition

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate a broad knowledge of principles and theories of computers and Information Technology following the latest developments.	Knowledge-Theoretical Understanding (Level 6)
A2	**Contemporary Trends, Problems and Research:**	N/A
A3	**Professional Responsibility:**	N/A

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Use a range of numerical in combination to solve specific computational problems.	Skills-Communication, ICT and Numeracy (level 6)
B2	**Modeling and Design:**	N/A
B3	**Application of Methods and Tools**: Gain aptitude in the use of productivity software (Computer Essentials/Online essentials/Word/Excel)	Knowledge Practical Application (level 6)

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic Skills:** Evaluate arguments, information and ideas germane to alternative technologies and computational methods.	Skills-Generic, Problem Solving and Analytical Skills (level 6)
C2	**Synthetic:**	N/A
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 complex ideas, conventionally and electronically, in a well-structured and coherent form using MS Software and cultivate presentational skills in a range of contexts involving developing creative posters, memos, advertisement, birthday cards and business cards	Skills, Communication and ICT & Numeracy (level 6)
D2	**Teamwork and Leadership:**	N/A
D3	**Organizational and Developmental Skills:** Organize information systematically involving, for instance the use of automated table of contents and update table of contents page numbers and files automatically.	Competence: Autonomy, Responsibility and context (level 6)
D4	**Ethics and Social Responsibility:** Gain an appreciation of ethics in the realm of information technology, for example, in terms of data confidentiality and integrity of data. Understand socially irresponsible behavior inherent in hacking and phishing, juxtaposed with socially responsible behavior involving green IT technologies, in gaining a comprehensive world view of the role of ethics in the life of the IT professional.	Competence: Autonomy, Responsibility and context (level 6)

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lecture	Lab				
1	2	2	A1, B1	Syllabus, Introduction, and Creating Moodle accounts. **Computer Essentials** 1.1 ICT 1.2 Hardware	Lecture/ Lab Demonstration	Oral Participation
2	2	2	A1, B3,	**Computer Essentials** 1.3 Software and Licensing 1.4 Start Up, Shut Down 2.1 Desktop and Icons 2.2 Using Windows 2.3 Tools and Settings	Lecture/ Lab Demonstration /Class Discussion	Oral Participation
3	2	2	A1, B3	**Computer Essentials** 3.1 Working with Text 3.2 Printing 4.1 Introducing Files and Folders 4.2 Organizing Files and Folders	Lecture/ Lab Demonstration	Oral Participation
4	2	2	A1, B3, D1, D4	**Computer Essentials** 5.1 Network Concepts 6.1 Protecting Data and Devices 6.2 Malware	Lecture/ Lab Demonstration /Class Discussion	Oral Participation / **ICDL Test 1**
5	2	2	A1, B3, D1, D4	**Online Essentials** 1.1 Key Concepts 1.2 Security and Safety 2.1 Using the Web Browser 2.2 Tools and Settings 2.3 Bookmarks 2.4 Web Outputs	Lecture/ Lab Demonstration	Oral Participation
6	2	2	A1, B3, C1, D1, D4	**Online Essentials** 3.1 Search 3.2 Critical Evaluation 3.3 Copyright, Data Protection 4.1 Online Communities 4.2 Communication 4.3 E-mail Concepts	Lecture/ Lab Demonstration /Class Discussion	Oral Participation
7	2	2	A1, B3, D1, D4	**Online Essentials** 5.1 Sending E-mail 5.2 Receiving E-mail 5.3 Tools and Settings 5.4 Organising E-mails 5.5 Using Calendars	Lecture/ Lab Demonstration	Oral Participation / **ICDL Test 2**

8	2	2	A1, B3, D1	**Word Processing** 1.1 Working with Documents 1.2 Enhancing Productivity 2.1 Enter Text 2.2 Select and Edit	Lecture/ Lab Demonstration /Class Discussion	Oral Participation
9	2	2	A1, B3, C1, D1	**Word Processing** 3.1 Text 3.2 Paragraphs 3.3 Styles 4.1Table Creation 4.2T able Formatting 4.3Graphical Objects	Lecture/ Lab Demonstration /Class Discussion	Oral Participation
10	2	2	A1, B3, C1, D1	**Word Processing** 5.1 Preparation 5.2 Outputs 6.1 Setup 6.2 Check and Print	Lecture/ Lab Demonstration /Class Discussion	Oral Participation
11	2	2	A1, B1, B3, C1, D1, D3	**Spreadsheets** 1.1 Working with Spreadsheets 1.2 Enhancing Productivity 2.1 Insert, Select 2.2 Edit, Sort 2.3 Copy, Move, Delete	Lecture/ Lab Demonstration /Class Discussion	Oral Participation / **ICDL Test 3**
12	2	2	A1, B1, B3, C1, D1	**Spreadsheets** 3.1 Rows and Columns 3.2 Worksheets 4.1Arithmetic Formulas 4.2 Functions	Lecture/ Lab Demonstration /Class Discussion	Oral Participation
13	2	2	A1, B1, B3, C1, D4	**Spreadsheets** 5.1 Numbers/Dates 5.2 Contents 5.3 Alignment, Border Effects 6.1 Create 6.2 Edit	Lecture/ Lab Demonstration /Class Discussion	Oral Participation / **Written Test**
14	2	2	A1, B1, B3, C1, D1	**Spreadsheets** 7.1 Setup 7.2 Check and Print		Oral Participation
15	2	2		**Revision**		
16	2	-	A1, B1, B3, C1, D3	**Spreadsheets**		/ **ICDL Test 4**

Teaching Materials:

Textbook(s):	Four Original ICDL textbooks (Computer Essentials, Online Essentials, MS Word and MS Excel) in addition to Tutorials created by ITCS101 instructors.
Handout(s):	Available on http://www.ahlia.edu.bh/moodle.
Reference(s):	Timothy O'Leary Linda O'Leary, Daniel O'Leary, *Computing Essentials*, 28th INTL. ED., McGraw-Hill Education; February 5, 2020. ISBN: 9781260570755

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
ICDL Test 1	The student will be evaluated through ICDL test focusing on Computer Essentials according to ICDL professional certification modules.	A1, B1, D3	20%
ICDL Test 2	This ICDL exam will assess the students in Online Essentials according to ICDL professional certification modules.	A1, C1, D3, D4	20%
ICDL Test 3	The student will be assessed on their practical application according to ICDL professional certification modules. The student is expected be familiarized with MS Word functionalities, which will be assessed online through accredited center BIET	A1, B3, D1, D3	20%
ICDL Test 4	The student will be assessed on their practical application and numerical skills according to ICDL professional certification modules. The student is expected be familiarized with MS Excel functionalities, which will be assessed online through accredited center BIET	A1, B1, B3, C1, D3	20%
Written Test	This is a theoretical exam which will assess the student overall knowledge, understanding and evaluate computational methods and draw conclusions with respect to technological methods and gadgets.	A1, C1, D4	20%
	Over all		100%

Admissions	
Minimum number of students	5
Maximum number of students	20

Course Code & Title:	**ITCS 122– Introduction to Programming Techniques**
Weight:	**(2-2-3)**
Prerequisite:	**ITCS 101**
NQF Level Allocated:	**6**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

Description: This course introduces the fundamental concepts of computer programming. The covered topics are primitive data types and operators, input/output, control statements, methods and functions, arrays and strings, classes and objects, and an introduction to Java applications and object-oriented design techniques. Emphasis is placed on the development of problem-solving skills.

Objective:

1. To understand the fundamentals of computer programming and programming languages.
2. To understand how to model and design a solution for a problem using algorithms and flowcharts.
3. To understand the programming language principles, operators, conditional and repetition statements, various built-in-functions such as mathematical, and string functions.
4. To create and implement user-defined data types such as arrays.
5. To gain facility in the writing, executing and debugging programs written in java language.

Semester:

Instructor:

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate a detailed knowledge and understanding of the main theories, principles and concepts embedded in the process, properties and techniques, employed in computer programming in a Java environment.	Knowledge: theoretical understanding [Level 6]
A2	**Contemporary Trends, Problems and Research: N/A**	
A3	**Professional Responsibility: N/A**	

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Solve simple problems using programs written in the computer programming language JAVA.	Knowledge: Practical Application [Level 5] Skills: Communication, ICT & Numeracy [Level 5]
B2	**Modeling and Design:** Formulate overall structure of the program & design the algorithms that meet specifications.	Knowledge: Practical Application [Level 5]
B3	**Application of Methods and Tools:** Apply Java tools to build, develop, design, implement, test, debug and deploy java programs.	Knowledge: Practical Application [Level 5] Skills: Communication, ICT & Numeracy [Level 5]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Analyze problem specification and effectively use fundamental programming constructs to meet the specification.	Generic Problem Solving & Analytical skills [Level 6]
C2	**Synthetic:** NA	
C3	**Creative: N/A**	

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** NA	
D2	**Teamwork and Leadership:** NA	
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 6]
D4	**Ethical and Social Responsibility: N/A**	

Course Structure (Outline)

	Course Structure (Outline)					
Week	**Hours**		**ILOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	2	2	A1, B2	Introduction to Computers and Problem Solving. Problem Solving and Solution Design.	Lecture	
2	2	2	A1, B3	Introduction to Java environment.	Lecture/ In-Class Supervised Work	
3	2	2	A1, B3	Arithmetic manipulation and Operators. Introduction to classes, Objects and Methods.	Lecture/ Lab Demonstration / In-Lab Supervised Work	In-Lab Exercises
4	2	2	A1, B3	Numbers and String variables (local and global variables), Common Programming Errors.	Lecture/ Lab Demonstration / In-Lab Supervised Work	Lab Project 1
5	2	2	A1, B1, B3, D3	Assignment operators, Logical operators, java API Packages, Math and String functions.	Lecture/ Lab Demonstration / In-Lab Supervised Work/ Project Supervision	In-Lab Exercises

6-7	4	4	A1, B1, B2, B3, C1, D3	Control statement: simple-if and nested-if.	Lecture / In-Lab Supervised Work / Project Supervision	Lab Project 2 (Week8)
8-9	4	4	B1, B2, B3, C1	Control statement: switch statement, Math class methods.	Lab Demonstration / In-Lab Supervised Work	Major Test (Week10)
10	2	2	A1, B3	Repetition (while-loop, do-while, for-loop).	Lecture/ Lab Demonstration	In-Lab Exercises
11	2	2	B1, B2, B3, C1	Repetition (while-loop, do-while, for-loop).	In-Lab Supervised Work	Lab Test
12	2	2	A1, B1, B2, B3, C1, D3	Repetition (while-loop, do- while, for-loop) &	Lecture/ Project Supervision	Lab Project 3
13	2	2	A1, B3	Arrays (1D Array).	Lab Demonstration	In-Lab Exercises
14	2	2	B1, B2, B3, C1, D3	2D Arrays.	In-Lab Supervised Work/ Project	Lab Project 4
15	2	2	B1, B2, B3, C1, D3	File handling: reading data from files, and writing data into files.	Lab Demonstration	In-Lab Exercises
16	2	-	A1, B1, B2, C1	All Topics		Final Exam

Teaching Materials:

Textbook(s):	Deitel T. R. Nieto. (2017) *Java How to Program*, 11th Edition, Prentice Hall.
Handout(s):	- Internal handouts (Hardcopies) prepared by course instructors. - PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle

Reference(s):	1. Malik D. (2012) *Java* Programming*: From Problem Analysis to Program Design*,
	   5th edition, Cengage Learning.
	2. Liang Y. D. (2013) *Introduction to Java Programming, Brief Version*, 9th Edition, Pearson Education.
	3. Savitch W. (2014) *Java: An Introduction to Problem Solving and Programming*,
	   7th Edition, Pearson Education.

Assessments:

Type of Assessment	Description	ILOs	Weighting
Lab Test	The knowledge of students will be evaluated throughout practical test, students should easily trace programs, configure the errors which may occur and rectify them by themselves.	B1, B3, C1, D3	30%
Major Test	The students will be assessed through theoretical test concentrating on three chapters to evaluate their acquaintance and understanding in the language of JAVA.	A1, B1, B2, C1	10%
Lab Projects	The students will be assessed on their practical application to create simple four projects which are covered through the chapters. Each project worth 20%, and average of best 3 projects will be taken.	B1, B2, B3, C1, D3	20%
In-Lab Exercises	The students will be evaluated through a number of exercises focusing on certain chapters to assess their knowledge and understanding in the area of fundamental of computing programming JAVA.	B1, B3	Formative

	This is a theoretical exam which will assess the students' overall knowledge and understanding of computational methods, logical operators, conditional statements, iteration statements and Arrays.		
Final Exam		A1, B1, B2, C1	40%
Overall			**100%**

Admissions	
Pre-requisites	**ITCS 101**
Minimum number of students	8
Maximum number of students	20

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

Course Code & Title:	**ITCS 201 – Object Oriented Programming I**
Weight:	**(2-2-3)**
Prerequisite:	**ITCS 122**
NQF Level Allocated:	**6**

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

Description: This course emphasizes on object oriented programming techniques using Java. It covers the implementation of object oriented concepts, such as: classes, objects, inheritance and polymorphism.

Objectives:

1. To develop an understanding of the principles underpinning object oriented programming.
2. To designate the important features of an object oriented programming language.
3. To understand how to design and implement object oriented concepts and software.

Semester:

Instructor:

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate detailed knowledge and understanding of the concepts involved in Java programming for implementing object oriented software.	Knowledge: theoretical understanding [Level 6]
A2	**Contemporary Trends, Problems and Research:**	N/A
A3	**Professional Responsibility:**	N/A
B. Subject-specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving:** Solve defined and some undefined problems by writing Java programming code.	Knowledge: Practical Application [Level 6] Skills: Communication, ICT & Numeracy [Level 6]
B2	**Modeling and Design:** Design the prototype for solving different kinds of real world problems, by clearly stating the concepts involved; such as Constructors, Abstract class, Inheritance, Polymorphism, Interface and their respective set of Properties and Methods using algorithms and UML models.	Knowledge: Practical Application [Level 6]
B3	**Application of Methods and Tools:** Apply Java programming language constructs and tools to write, run, trace, and debug object oriented programs.	Knowledge: Practical Application [Level 6] Skills: Communication, ICT & Numeracy [Level 6]
C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic skills:** Evaluate and find the best Java object oriented concepts needed to develop efficient and effective programs.	Generic Problem Solving & Analytical skills [Level 6]
C2	**Synthetic:** Integrate_different application objects and object oriented concepts into complete computer applications needed to solve real world problems.	Generic Problem Solving & Analytical skills [Level 6]

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:** Demonstrate the ability to present Java programs clearly in a well-structured manner.	Communication, ICT and Numeracy Skills [Level 6]
D2	**Teamwork and Leadership:**	N/A
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignments.	Competence: Autonomy, Responsibility and Context [Level 6]
D4	**Ethics and Social Responsibility:**	N/A

Course Structure (Outline)

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
	Lab	**Lect.**				
1	2	2	A1	Introduction to object oriented programming language.	Lecture	
2	2	2	A1, B2, B3	Introduction to Classes, Objects, Methods and Instance Variables, Default, Public, and Private Access Modifiers, UML Notations.	Lectures/ lab demonstration	In-Lab Exercises
3	2	2	B3	Declaring a Class and Instantiating an Object, Setter, Getter, and Operational Methods.	Lecture/ lab demonstration	In-Lab Exercises
4	2	2	A1, B3, D1, D3	Constructor, Default, No-Argument and Arguments Constructors, Initializing Objects with Constructors.	Lecture/ Lab demonstration / In-Lab Supervised Work	Assignment 1
5	2	2	A1, B1, B3, C1	Overloading Methods, this Keyword, Encapsulation and Data Hiding.	Lecture/ Lab demonstration / In-Lab Supervised Work	In-lab Exercises
6	2	2	A1, B1, B3, C1	Static Variables, Static Methods, Static Class Members, Static Import.	Lecture/ Lab demonstration / In-Lab Supervised Work	In-lab Exercises
7	2	2	A1, B1, B2, B3, C1	Enumerations, Garbage Collection and Method finalize, Final Instance Variables, Creating Packages, Package Access, and UML Package Notations.	Lecture/ Lab demonstration / In-Lab Supervised Work	In-lab Exercises
8	2	2	A1, B1, B2, B3, C1	Association, Aggregation Relationships and UML Notation.	Lecture/ In-Lab Supervised Work	Lab Test 1

9	2	2	A1, B1, B2, B3, C1, C2, D1, D3	Inheritance and UML Notation.	Lecture/ Lab demonstration / In-Lab Supervised Work	Assignment 2
10	2	2	A1, B1, B3	Protected Access Modifier, Software Engineering with Inheritance, Object Class and super Keyword.	Lecture/ Lab demonstration / In-Lab Supervised Work	In-Lab Exercises
11	2	2	A1, B1, B3, C1	Polymorphism and Overriding Methods.	Lecture/ Lab demonstration / In-Lab Supervised Work	In-Lab Exercises
12	2	2	A1, B1, B2, B3, C1, C2, D1, D3	Static and Dynamic Binding.	Lecture/ Lab demonstration / In-Lab Supervised Work	Assignment 3
13	2	2	A1, B1, B2, B3, C1, C2	Abstract Class, Abstract Method and UML Abstract Notation.	Lecture/ In-Lab Supervised Work	Lab Test 2
14	2	2	B1, B3	Final Methods and Classes.	Lectures/ lab demonstration	In-Lab Exercises
15	2	2	A1, B1, B2, B3, C1, C2, D1, D3	Interfaces, Common Interfaces of the Java API and UML Interfaces Notation.	lab demonstration/ In-Lab Supervised Work	Assignment 4
16	2	-	A1, B1, B2, C1	All Topics		Final Exam

Teaching Materials:

Textbook(s):	Deitel T. R. Nieto. (2017) *Java How to Program*, 11th Edition, Prentice Hall.
Handout(s):	**-** Internal handouts (Hardcopies) prepared by course instructors. - Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. White B. (2018) *Mastering Java: An Effective Project Based Approach including Web Development, Data Structures, GUI Programming and Object Oriented Programming*, independently published. 2. Gaddis T. and Muganda G. (2018) *Starting Out with Java, From Control Structures through Data Structures*, 4th Edition, Pearson Education. 3. Liang Y. D. (2017) *Introduction to Java Programming Comprehensive Version*, 11th Edition Prentice Hall. 4. Barnes D. J. and Kölling M. (2016) *Objects First with Java: A Practical Introduction Using BlueJ,* 6th Edition, Prentice Hall. 5. Litvin M. and Litvin G. (2015) Java Methods: Object-Oriented Programming and Data Structures, 3rd AP edition, Skylight Publishing. ISBN: 9780982477564

Assessments:

Type of Assessment	Description	ILOs	Weighting
Assignments	Each group of students is required to prepare four assignments; each assignment worth 20%, the average will be taken. Assignments include both theoretical and practical questions to develop an object oriented program for solving a problem.	A1, B1, B2, B3, C1, C2, D1, D3	20%
Lab Tests	Two practical tests will be for two hours and worth 20% each, The tests used to assess students in the implementation of object-oriented programs using Java.	B1, B3, C1, C2	40%
Final Exam	Final exam will be for two hours and including all types of question: problem solving, MCQs and T/F, short answers, programming.	A1, B1, B2, C1	40%
In-Lab Exercises	The students will practice through a number of exercises to design and implement the object oriented programming concepts.	B1, B2, B3	Formative

	Overall	100%

Admissions	
Minimum number of students	5
Maximum number of students	20

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COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF IT

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 209 – Discrete Structures

Weight: (3-0-3)

Prerequisite: MATH 102

NQF Level Allocated: 6

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

Description: The course covers the fundamental concepts of discrete mathematics that are widely used in information technology and engineering. The covered topics are logic and mathematical reasoning, sets, functions, counting and combinatorial techniques, graphs and trees.

Objective:

1. To provide understanding of basic concepts and ideas in discrete mathematics.
2. To enable learners to gain an insight into the use of basic mathematical ideas useful in various fields of study including computer science, information technology, physical sciences and engineering.
3. To explain with examples the basic terminology of functions, relations, and sets as well as perform operations associated with them.

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate *detailed* knowledge and understanding of discrete mathematical structures	Knowledge: theoretical understanding [Level 6]
A2	**Contemporary Trends, Problems and Research: N/A**	
A3	**Professional Responsibility: N/A**	

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** *Use basic skills to solve* mathematical and logical problems using various discrete structure aspects	Knowledge: Practical Application [Level 6] Skills: Communication, ICT & Numeracy [Level 6]
B2	**Modeling and Design:** *Adapt practices to model real-life problems* including those arising in computing context	Knowledge: Practical Application [Level 6]
B3	**Application of Methods and Tools: N/A**	

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** *Evaluate different areas* of problems to determine the underlying logic, structure or recurrence relations.	Generic Problem Solving & Analytical skills [Level 6]
C2	**Synthetic: N/A**	
C3	**Creative: N/A**	

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication: N/A**	
D2	**Teamwork and Leadership: N/A**	
D3	**Organizational and Developmental Skills:** *Operate with accountability* to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 6]

D4	Ethical and Social Responsibility: N/A	

Course Structure (Outline)

Week	Hours Lec.	Hours Lab	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3		A1	Introduction	Lecture	
2	3	-	A1, B1, C1	**Logic:** propositions, truth tables, logical connectives.	Lecture/ In-Class Supervised Work	In-Class Exercises
3	3	-	A1, B1, B2, C1	Tautologies, contradictions, logical equivalences, predicates and quantifiers.	Lecture/ In-Class Supervised Work	Quiz 1
4	3	-	A1, B1, C1	**Proofs:** induction and contradiction.	Lecture/ In-Class Supervised Work	In-Class Exercises
5	3	-	A1, B1, B2, C1, D3	**Sets:** operations on sets, cardinality of sets, power set, Cartesian Product.	Lecture/ In-Class Supervised Work	Quiz 2/ Assignment 1
6-7	6	-	A1, B1,B2, C1	**Functions:** 1-1, onto, bijection, graph of function, inverse and composition functions.	Lecture/ In-Class Supervised Work	In-Class Exercises/ Test 1 (week 7)
8-9	6	-	A1, B1, C1	**Counting Techniques:** Sum and Product Rules, Permutations and Combinations, Pigeonhole Principle, Binomial Coefficients.	Lecture/ In-Class Supervised Work	Quiz 3 (week9)/ In-Class Exercises
10-11	6	-	A1, B1, C1	Sequences, Summations, Applications of Recurrence Relations, Solving Recurrences.	Lecture/ In-Class Supervised Work	Quiz 4 (week 11)/ In-Class Exercises

12-13	6	-	A1, B1, B2, C1, D3	**Graphs:** types of graphs, special graphs, paths and connectivity, isomorphism, Euler and Hamilton paths and circuits, Chromatic number, planar graphs.	Lecture/ In-Class Supervised Work	Quiz 5 (week 13)/ In-Class Exercises/ Assignment 2
14-15	6	-	A1, B1, B2, C1	**Trees:** Tree Traversal, applications of trees.	Lecture/ In-Class Supervised Work	Test 2 (week 14)/ In-Class Exercises
16	2	-	A1, B1, B2, C1	All Topics		Final Exam

Teaching Materials:

Textbook(s):	Rosen K. H. (2019) *Discrete Mathematics and Its Applications*, Global Edition, 8th Edition, McGraw-Hill.
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Gordon J. (2012) *Mathematics of Discrete Structures for Computer Science*, Springer. 2. Bernard Kolman, Robert Busby, Sharon C. Ross. (2017), Discrete Mathematical Structures (Classic Version) (6th Edition) (Pearson Modern Classics for Advanced Mathematics Series), Pearson; 6 edition (March 30, 2017). ISBN: 978-0134696447 3. A. Tucker, Hoboken, NJ (2012) Applied Combinatorics - 6TH ED., John Wiley and Sons, 2012. ISBN: 9780470458389 4. More references are available in the course website in Moodle.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Quizzes	Five, in class, written quizzes will be conducted and the average of best four quizzes will be considered. Quizzes' questions will mainly assess knowledge and understanding of set theory, symbolic logic, functions and graph theory; as well as evaluate problem solving.	A1, B1	10%

Assignments	Two assignments to be given to students and their average will be considered. Assignment questions will cover different course concepts and skills.	B1, B2, C1, D3	10%
In-Class Exercises	Exercises will be conducted during class time to assess students understanding of the various topics covered in the course such as symbolic logic, recurrence relations, functions, sets, etc.	B1, B2	Formative
Tests	Student will be assessed through two theoretical tests where each will take one hour of class time. Each test worth 20 marks and their total will be considered at the end. Test 1 will cover all topics from week 1 to 6 whereas Test 2 will cover all the topics from week 8 to 14.	A1, B1, B2, C1	40%
Final Exam	Final exam will be for two hours and including all types of question: MCQs, short answers questions and problem solving.	A1, B1, B2, C1	40%
Overall:			**100 %**

Admissions	
Pre-requisites	**MATH 102**
Minimum number of students	**8**
Maximum number of students	**25**

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COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 214 - Computer systems

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

Prerequisite: ITCS 101

NQF Level Allocated: Level 6

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

Description: This course is an introduction to the fundamental concepts of computer systems and their performance analysis. It explores how computers execute programs and manipulate data. Topics covered include: data representation of primitive data types, machine-level programming, digital logic, memory organization and management, I/O devices and storage devices. In addition, it covers the techniques used to improve computer performance and to solve its problems.

Objective:

1. To explain various data representation methods of the basic data types.
2. To introduce the physical structure of ALU and logic design.
3. To help students understand the behavior of processor by introducing the instruction set and assembly programming.
4. To recognize and describe different kinds of storage systems and I/O devices.
5. To introduce the concepts of evaluating and improving computer system performance.

SEMESTER: ACADEMIC YEAR:

INSTRUCTOR:
OFFICE TEL:
EMAIL:

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate a broad knowledge of the concept and theories of computer system, such as digital logic, data representation and manipulation, and storage systems.	Knowledge: theoretical understanding [Level 6]
A2	**Contemporary Trends, Problems and Research:** Demonstrate awareness of the current trends and advancements in computer systems.	Knowledge: theoretical understanding [Level 6]
A3	*Professional Responsibility:* *N/A*	
B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Demonstrate knowledge of the methods and techniques used to solve the problems of computer systems and thus improve its performance, as well as to solve computational problems using logic circuit design and assembly programming.	Knowledge: Practical Application [Level 6] Skills: Communication, ICT &Numeracy [Level 6]
B2	**Modeling and Design:** Model the structure of ALU and design simple logic circuits to implement different kind of operations.	Knowledge: Practical Application [Level 6]
B3	*Application of Methods and Tools:* *N/A*	
C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Demonstrate the ability to analyze the computer system performance and identify the computer problems.	Generic Problem Solving & Analytical skills [Level 6]
C2	*Synthetic:* *N/A*	
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:** Express and communicate ideas in written and oral form.	Communication, ICT and Numeracy Skills

						[Level 6]
D2	*Teamwork and Leadership:*			*N/A*		
D3	**Organizational and Developmental Skills:** Ability to work effectively as a member of a development team.					Competence: Autonomy, Responsibility and Context [Level 6]
D4	*Ethics and Social Responsibility:*			*N/A*		

Course Structure (Outline)

Course Structures (Outline)						
Week	**Hours**		**ILOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	3	-	A1	Syllabus- Introduction	Lecture	
2-3	6	-	A1, B1, C1	**Data Representation:** To describe numbering systems, data type size and numeric range, as well as different representation techniques to represent real, integer, Boolean, memory address, and characters together with performance evaluation.	Lecture/ In-Class Supervised Work	In-Class Exercises/ Quiz 1 (week3)
4-6	9	-	A1, B1, C1	**Data Storage:** To describe the three types of storage devices, with performance evaluation and data format.	Lecture/ In-Class Supervised Work	In-Class Exercises/ Assignment1
7-8	6	-	A1, B1, B2, C1	**Processor Technology and Architecture:** To describe Boolean Algebra, logic design.	Lecture/ In-Class Supervised Work	In-Class Exercises/ Quiz 2
9	3	-	A1, B1	**Processor Technology and Architecture:** To describe instruction set, assembly programming	Lecture/ In-Class Supervised Work	In-Class Exercises

10-11	6	-	A1, A2, D1, D3	**Processor Technology and Architecture:** To describe addressing modes and CPU concepts.	Lecture/ Independent Learning	Major Test (week10)/ Assignment 2
12	3	-	A1, B1, C1	**System Integration and Performance:** To describe: system bus, I/O ports, interrupt, fault tolerance, Cache and Buffers.	Lecture/ In-Class Supervised Work	In-Class Exercise s/ Quiz 3
13	3	-	A1, B1, C1	**System Integration and Performance:** To describe: parallel processing.	Lecture/ In-Class Supervised Work	In-Class Exercises
14	3	-	A1	**I/O Devices:** Common I/O device types with their characteristics	Lecture/ Class Discussion	Quiz 4
15	3	-	A1, A2, D1, D3	**I/O Devices:** Memory mapped I/O and DMA.	Lecture/ Independent Learning	
16	2	-	A1, B1, B2, C1	**All Topics**		Final Exam

Teaching Materials:

Textbook(s):	1. Stallings W. (2019) *Computer Organization and Architecture: Designing for Performance,* 11th Edition, Pearson, ISBN-13: 9780134997193. 2. Burd, S. D. (2015) *Systems Architecture*, 7th Edition, Cengage Learning.
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Siewiorek, D. and Swarz, R., (2017). Reliable Computer Systems: Design

and Evaluatuion. Digital Press.

2. King-Sun Fu, (2017), *Special Computer Architectures for Pattern Processing* 1st Edition, CRC Press; 1 edition (December 12, 2017). ISBN: 978-1315897684

3. Glenn Brookshear, Dennis Brylow, (2014), *Computer Science: An Overview,* Pearson; 12th edition (April 11, 2014);0133760065, 978-0133760064

4. Hamacher C., Vranesic Z., Zaky S. and Manjikian N. (2011) Computer Organization and Embedded Systems, McGraw-Hill.

5. Patterson D. and Hennessy J. (2013) Computer Organization and Design, 5th Edition, Newnes

6. Brookshear J. (2019) Computer Science: An Overview, 13thEdition, Addison- Wesley. ISBN: 978-0-13-489172-9

Assessment

Type of Assessment	Description	ILOs	Weighting
Quizzes	Four written quizzes to be conducted with different question types like: problem solving and short-answer. Each quiz is for 30 minutes. The total of best three quizzes will be considered, each worth 5%.	A1, B1, B2, C1	15%
Assignments	Two assignments to be given to students, each assignment worth 15%, and the total is the average of two assignments. The assignments will assess students' awareness in the current trends and advancements in computer systems.	A2, D1, D3	15%
In-Class Exercises	In-class exercises consisting mainly of problem solving and performance analysis questions.	B1, B2, C1	Formative
Major Test	The major test is a written, in-class 90 minutes test. It will cover topics studied in the first nine weeks. The test will include several types of questions such as: short-answer, essay and problem solving.	A1, B1, B2, C1	30%
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It will consist of problem solving, short-answer and essay questions.	A1, B1, B2, C1	40%
Overall			**100%**

Admissions	
Minimum number of students	5
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 221 – Object Oriented Programming II**
WEIGHT:	**(2 - 2 - 3)**
PREREQUISITE:	**ITCS 201**
NQF Level Allocated:	6
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

DESCRIPTION: This course is built on the information gained from the previous Java programming courses. It concentrates on modeling the GUI and advanced software programming issues such as: Java Applets, Multimedia (applets and applications) and Multithreading**.**

OBJECTIVES:
1. To understand advanced concepts of Java Programming Language such as exception and error handling, Multithreading and applets.
2. To explain how to create and use generic methods and types effectively.
3. To teach students how to write multimedia and multithreaded applets and applications.
4. Write applications and applets, and develop a GUI interface.

Semester:

Instructor (s):

Office Telephone:

Email (s):

INTENDED LEARNING OUTCOMES (ILOS)

Upon successful completion of the course, students should be able to:

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	Concepts and Theories: Demonstrate an understanding of advanced Java programming concepts, such as exception and error handling, generic methods and classes, Java applets, multimedia and multithreading.	Knowledge: theoretical understanding [Level 7]
A2	Contemporary Trends, Problems and Research: NA	
A3	Professional Responsibility: NA	
B. Subject-Specific Skills		**NQF Descriptor/ Level**
B1	Problem Solving: Analyze and identify real world and computer application problems, and develop effective java applications and applets to solve these problems.	Knowledge: Practical Application [Level 6] Generic Problem Solving & Analytical skills [Level 6] Skills: Communication, ICT & Numeracy [Level 6]
B2	Modeling and Design: Design computer programs that meet user specifications utilizing Java programming language.	Knowledge: Practical Application [Level 6]
B3	Application of Methods and Tools: Apply Java programming language constructs and tools to write, run, trace, and debug object oriented programs.	Knowledge: Practical Application [Level 6] Skills: Communication, ICT & Numeracy [Level 6]
C. Thinking Skills		**NQF Descriptor/**
C1	Analytic: Analyse user requirements and problems, and evaluate the effectiveness and performance of java programs needed to meet users' expectations.	Generic Problem Solving & Analytical skills [Level 6]
C2	Synthetic: Integrate Java application components into one java project to organize the data and make the program more flexible.	Generic Problem Solving & Analytical

C3	<u>Creative:</u> Demonstrate creativity in solving new problems by developing Java programs and applets.	Generic Problem Solving & Analytical skills [Level 6]
D. General and Transferable Skills (Other Skills Relevant to Employability and Personal Development)		**NQF Descriptor/ Level**
D1	<u>Communication:</u> NA	
D2	<u>Teamwork and Leadership:</u> NA	
D3	<u>Organizational and Developmental Skills:</u> Demonstrate ability to organize ideas and effectively allocate time in given assignment.	<u>Competence: Autonomy, Responsibility and Context [Level 6]</u>
D4	<u>Ethical and Social Responsibility:</u> NA	

Course Structure (Outline)						
Week	Week		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1	Introduction	Lecture	
2	2	2	A1, B1, B3	**Exception Handling:** Exceptions and Exception Types, Throwing Exceptions, Catching Exceptions.	Lecture/ Lab Demonstration	In-Lab Exercises
3-5	6	6	B1, B2, B3, C1	**Exception Handling:** Creating user defined exception classes. The finally Clause Cautions, chained exceptions, precondition and preconditions Assertions.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
6	2	2	A1, B1, B2, B3, C1	**Generics:** Introduction and motivation for Generic methods, and overloading generic methods.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
7	2	2	B1, B2, B3, C1, C2, C3, D3	**Generics:** Generic classes, Generic and inheritance.	Lecture/ In-Lab Supervised Work/ Project Supervision	Lab Project1/ In-Lab Exercises
8-9	4	4	A1, B1, B2, B3, C1, C2. D3	**Introduction to Java Applets:** Sample Applets, simple Java Applet, Applet life-Cycle methods, Security in Applets.	Lecture/ Lab Demonstration/ In-Lab Supervised Work	Lab Test1 (week 8)/ In-Lab Exercises
10	2	2	B1, B2, B3, C1, C2	**Java Applets:** Generic methods, Generic classes and Java Applets.	In-Lab Supervised Work	In-Lab Exercises
11	2	2	A1, B1, B2, B3	**Multimedia:** Introduction, manipulating images, loading and playing audio clips, Java media framework.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
12-13	4	4	B1, B2, B3, C1, C2, C3	**Multimedia:** Manipulating images, loading and playing audio clips, Java media framework.	Lecture/ In-Lab Supervised Work	Lab Test2 (week13)/ In-Lab Exercises
14	2	2	A1, B1, B2, B3, C1, C2, C3, D3	**Multithreading and RMI:** Introduction, life-Cycle of a thread, thread's properties and thread scheduling, thread synchronization, DeadLock, Socket Class.	Lecture/ Lab Demonstration/ In-Lab Supervised Work/ Project Supervision	Lab Project2/ In-Lab Exercises

15	2	2	A1, B2, B3, C2	Remote Method Invocation	Lecture/ Lab Demonstra-tion/ In-Lab	In-Lab Exercises
16	2	-	A1, B1, B2, C1, C2, C3	**All Topics**		Final Exam

TEACHING MATERIALS:

TEXTBOOK(S): Deitel T. R. Nieto. (2017) *Java How to Program*, 11th Edition, Prentice Hall.

HANDOUT(S): PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle

REFERENCE(S):
1. Savitch, W. (2017). Java: An Introduction to Problem Solving and Programming Plus MyProgramming Lab with Pearson eText-Access Card Package. Pearson.
2. Gaddis T. and Muganda G. (2019) *Starting Out with Java, From Control Structures through Data Structures*, 4th Edition, Pearson Education. ISBN: 9780134787961
3. Barnes D. J. and Kölling M. (2016) *Objects First with Java: A Practical Introduction Using BlueJ,* 6th Edition, Prentice Hall.

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
Lab Tests	The student will be assessed through two practical tests, which will take two hours each. In each test, the students will be asked to develop a JAVA program for solving a problem.	B1, B3, C1, C2, D3	40%
Lab Projects	Two lab projects to be given, each worth 10%. The project could cover any topic in the course.	A1, B1, B2, B3, C1, C2, C3, D3	20%
Final Exam	Final exam will be for two hours, including all types of question: MCQs, short answers questions, true/false, problem solving, etc.	A1, B1, B2, C1, C2, C3	40%
In-Lab Exercises	Exercises will help the students in understanding and digesting all the course topics.	B1, B3, C1, C2	Formative
Overall			**100%**

Admissions	
Minimum number of students	5
Maximum number of students	20

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Course Code & Title: ITCS 222 - Visual Programming

Weight: (2 - 2 - 3)

Prerequisite: ITCS 122

NQF Level Allocated: 6   **NQF Notional Hours / Credits: 120/ 12**

Description:

This course introduces Windows programming environment. Students learn how to write and develop programs with a polished graphical user interface (GUI) using event-driven programming language, which is Visual Basic. Topics include data types and structures, arithmetic and logical operators, declarations and input/output, control structures, and functions. Emphasis is placed on the development of problem- solving skills.

Objective:

1. To understand the concepts and techniques of event-driven programming.
2. To examine the modular programming using subroutine, function, and modules.
3. To create and implement user-defined data types such as arrays, structures, files, and database using Visual Basic.
4. To understand the Visual Basic Integrated Development Environment (IDE) and Windows programming by writing, executing and debugging Visual Basic programs.

Semester:

Instructor(s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate understanding and detailed knowledge of the concepts of event-driven programming, IDE environment and GUI Programming techniques	Knowledge: theoretical understanding [Level 6]
A2	**Contemporary Trends, Problems and Research:**	N/A
A3	**Professional Responsibility:**	N/A
B. Subject-specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving:** Identify a real world problem and solve it by using visual basic programming language	Knowledge: Practical Application [Level6] Skills: Communication, ICT & Numeracy [Level6]
B2	**Modeling and Design:** Design computer applications and create prototypes to meet given requirements.	Knowledge: Practical Application [Level6]
B3	**Application of Methods and Tools:** Apply Visual Studio software to write, execute and correct the syntax, logical and run time errors.	Knowledge: Practical Application [Level6] Skills: Communication, ICT & Numeracy [Level6]
C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic skills:** Analyze problem specification and use appropriate visual programming constructs to meet these requirements.	Generic Problem Solving & Analytical skills [Level6]
C2	**Synthetic:** Integrate different visual programming constructs such as database and modules while developing real life projects.	Generic Problem Solving & Analytical skills [Level6]
C3	**Creative Thinking and innovation:** Apply new and/or using conventional programming techniques innovatively for solving real world problems.	Generic Problem Solving & Analytical skills [Level6]
D. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:**	N/A
D2	**Teamwork and Leadership:**	N/A

D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level6]
D4	**Ethics and Social Responsibility:**	N/A

Course Structure (Outline)

Course Structure (Outline)						
Week	**Hour**		**ILOs**	**Topics**	**Teaching Methods**	**Assessment Method**
	Lec.	**Lab**				
1	2	2	A1	Introduction to Event-Driven Programming.	Lectures/Lab Demonstration	
2	2	2	A1, B3	**GUI :** Labels, Textboxes, Buttons, Group Boxes, Panels, Check box, Radio buttons ToolTips, Event Handling.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
3	2	2	A1, B3	**Relational Operators:** Compound Assignment Operators, Equality and Relational Operators.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
4	2	2	A1, B3	**Math Built-in Function:** Sqrt, Round, Int, Implicit Argument Conversions, Option Strict and Data-Type Conversions.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
5	2	2	A1, B3	**String:** Create and Manipulate the String Objects of String and String Builder Classes.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
6	2	2	A1, B1, B3	**Control Statements- GUI :** Mouse-event Handling, Keyboard-Event Handling, checklist box control, Menus, Tab control.	Lecture/ In-Lab Supervised Work	In-Lab Exercises

7	2	2	A1, B1, B2, B3, C1, D3	**Control Statements - GUI:** List control, Combo Box control, Date Time Picker, Month calendar control.	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Assignment 1
8	2	2	A1, B1, B3,C1	**Repetition Statements:** Different types of loops.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
9	2	2	A1, B1, B3, C1, C2	**Modules and Procedures:** Creating procedures, specifying the scope, types of procedures and calling the	Lecture	Lab Test 1
10	2	2	B1, B3	**Other Control Statements:** Logical Operators, Exit Terminate Repetition Statements, Continue Repetition Statements.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
11	2	2	B3	**Syntax Error Correction:** Using the Debugger by locating Logic Errors and Run Time Errors.	Lab Demonstration	In-Lab Exercises
12	2	2	A1, B1, B2, B3, C1, C2, D3	**Sub Procedures, Function and Modules**	Lecture/ In-Lab Supervised Work	In-Lab Exercise/ Assignment 2
13	2	2	A1, B1, B3, C1	**Arrays:** One-Dimensional and Multidimensional	Lecture/ In-Lab Supervised Work	In-Lab Exercise
14	2	2	B3, C2	**Accessing Text Files:** Read/Write a text file line by line **Accessing Databases:** Creating a Database Application in Visual Basic	Lab Demonstration	Lab Test 2
15	2	2	B1, B2, B3, C1, C2, C3, D3	Student Project	Project Supervision	Project Presentation
16	2	-	A1, B1, B2, C1, C2	**All Topics**		Final Exam

Teaching Materials:

Textbook(s):	Tony Gaddis, Kip R. Irvine (2019) *Starting Out With Visual Basic,* 8th Edition, Pearson, ISBN: 978-0135204658
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Gaddis T. and Irvine K. (2016) Starting Out With Visual Basic, 7th Edition, Pearson. 2. Schneider D. (2019) Introduction to Programming Using Visual Basic, 11th Edition, Pearson. 3. McGrath M. (2019) Visual Basic in easy steps: Updated for Visual Basic 2019, In Easy Steps Limited, 6th Edition, 2019. 4 Alessandro Del Sole (2016), Visual Basic - 1ST ED. Unleashed, Sams Publishing. PUBLICATION: Indianapolis, Ind. : Sams, ISBN: 9780672334504

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Lab Tests	Two practical tests to be given to students during lab time where each will take two hours and worth 15 marks. The total of both tests will be considered at the end. The first test will cover topics from week 1 to 8 and the second test will cover topics from week 9 to 14.	B1, B3, C1, C2	30%
Assignments	Two assignments will be given to students and their average will be considered. These assignments will assess students' skills in using different visual programming constructs to solve given problems.	A1, B1, B2, B3, C1, C2, D3	10%
In-Lab Exercises	Exercises will be conducted in the lab and it will allow the students to practice all the topics covered in the course such as designing forms, using built-in functions, writing procedures, etc.	B1, B3, C1, C2	Formative
Project	One practical project will be given the students to assess their skills in applying the different concepts learned during the course in solving a real-life problem. The project covers all the chapters comprehensively	B1, B2, B3, C1, C2, C3, D3	20%
Final Exam	Final exam will be for two hours, including all types of questions: MCQs, short answers questions, problem solving, etc.	A1, B1, B2, C1, C2	40%
Overall:			**100 %**

Admissions	
Minimum number of students	5

Maximum number of students	20

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COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
<u>**COURSE SYLLABUS/ SPECIFICATION**</u>

Course Code & Title: ITCS 224 - Data Structures

Weight: **(2 - 2 - 3)**

Prerequisite: ITCS 201

NQF Level Allocated: Level 6

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

Description:

This course introduces different data structures such as: arrays, linked list, stacks, queues, hash tables, and graphs. It covers the design and analysis of different algorithms to manipulate these data structures, such as: create, traverse, delete data, and insert data. The students will implement the data structure algorithms and apply them using a programming language.

Objective:

1. To overview various types of data structures.
2. To explain the algorithms associated with each data structure and their implementations.
3. To provide an analysis of the efficiency of algorithms associated with each data structure in terms of both time and space.
4. To demonstrate the effective use of data structures in computational problem solving.

SEMESTER: ACADEMIC YEAR:

INSTRUCTOR:
OFFICE TEL:
EMAIL:

Intended Learning Outcomes (ILOs):

	A. Knowledge and Understanding	NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate a broad knowledge of the concepts and theories of various data structures and their algorithms.	Knowledge: theoretical understanding [Level 6]
A2	**Contemporary Trends, Problems and Research:** N/A	N/A
A3	**Professional Responsibility:** N/A	N/A

	B. Subject-specific Skills	NQF Descriptor/ Level
B1	**Problem Solving:** Identify problems and choose the appropriate and efficient data structures to solve these problems.	Knowledge: Practical Application [Level 6] Skills: Communication, ICT & Numeracy [Level 6]
B2	**Modeling and Design:** Formulate data model, and design software solution through the application of the appropriate data structures.	Knowledge: Practical Application [Level 6]
B3	**Application of Methods and Tools:** Use a programming language to implement various data structures and apply different methods of designing algorithms.	Knowledge: Practical Application [Level 6] Skills: Communication, ICT & Numeracy [Level 6]

	C. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic:** Evaluate and analyze the performances of algorithms associated with the various data structures.	Generic Problem Solving & Analytical skills [Level 6]
C2	**Synthetic:** N/A	N/A
C3	**Creative Thinking and innovation:** N/A	N/A

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Express and communicate ideas in written and oral form.	Communication, ICT and Numeracy Skills [Level 6]
D2	**Teamwork and Leadership:**	N/A
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 6]
D4	**Ethics and Social Responsibility:**	N/A

Course Structure (Outline)

Course Structures (Outline)						
Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Methods	Assessment Method
	Lec.	Labs				
1	2	2	A1	Syllabus- Introduction	Lecture	-
2-3	4	4	A1, B1, B2, B3, C1	**Arrays:** -Array creation and initialization. -Insertion and deletion of an element. -Multidimensional arrays and their representations. -Performance Analysis.	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	In-Class Exercises/ In-Lab Exercises
4	2	2	B2, B3, C1, D1, D3	**Arrays:** -Sequential and binary search operations. -Selection and insertion sort operations.	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	Assignment 1

5-6	4	4	A1, B1, B2, B3, C1	**Stack:** -Applications of stack. -Push and pop operations. -Performance Analysis.	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	In-Class Exercises/ In-Lab Exercises/ Major Test
7-8	4	4	A1, B1, B2, B3, C1	**Queue:** -Types of queues like circular one. -Insertion and deletion operations on queues. -Performance Analysis.	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	In-Class Exercises/ In-Lab Exercises
9-10	4	4	A1, B1, B2, B3, C1, D1, D3	**Linked list:** - Linked list, doubly linked list and circular linked list. -Insertion and deletion operations on linked list. -Performance Analysis.	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	Assignment 2/ In-Class Exercises/ In-Lab Exercises
11-12	4	4	A1, B1, B2, B3, C1	**Hash Tables:** -Hash function. -Collision resolution. -Performance Analysis.	Lecture/ In- Class Supervised Work / In-Lab Supervised Work	In-Class Exercises/ In-Lab Exercises
13-14	4	4	A1, B1, B2, B3, C1	**Trees:** -Definitions and basic terminologies. -In-order, pre-order and post- order traversal. -Tree creation, insertion and deletion of a node. -Performance Analysis.	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	In-Class Exercises/ In-Lab Exercises

15	2	2	A1, B1, B2	**Graphs Concepts:** -Undirected and directed graphs. -Representing graphs.	Lecture/ In-Class Supervised Work	Lab Test
16	2	-	A1, B1, B2, C1	All Topics		Final Exam

Teaching Materials:

Textbook(s):	1. Hemant Jain (2018) Problem Solving in Data Structures & Algorithms Using Java, 2nd Edition, Independently Published, ISBN: 978-1723982101
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Weiss M. A. (2011) Data Structures and Problem Solving using Java, 4th Edition, Pearson Education. 2. Goodrich M. T., Tamassia R. and Goldwasser M. H. (2015) *Data Structure and Algorithms in Java*, 6th Edition, Wiley, *9781118808573. 3. James Cutajar (2018) Beginning Java Data Structures and Algorithms, Packt Publishing 4. Dale N., Joyce D. and Weems C. (2016) *Object Oriented and data structures using Java*, 4th Edition, Jones & Bartlett Publishers, ISBN: *9781284089097

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
In-Lab Exercises	They consist mainly of implementing different data structures.	B3	Formative
In-Class Exercises	They cover problem solving and analysis questions and help students in differentiating between the various data structures.	B1, B2	Formative
Assignments	Two assignments, each one covers a number of data structures used for solving a problem and will worth ten marks. The students have to analyze the performance of each data structure.	B1, B2, B3, C1, D1, D3	20 %
Major Test	One written test to be given to students. The major test is a written, in-class 90 minutes test. It will cover topics studied in the first 10 weeks. The majority of questions are problem solving and analysis questions.	A1, B1, B2, C1	20 %

Lab Test	A practical comprehensive test of two hours. It consists of questions to implement data structures appropriate to solve given problems.	B1, B3	20%
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It consists of problem solving and analysis questions.	A1, B1, B2, C1	40%
Overall			100%

Admissions	
Minimum number of students	5
Maximum number of students	25

COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY

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

CODE & TITLE:	**ITCS 303 – Design and Analysis of Algorithms**
WEIGHT:	**(2 - 2 - 3)**
PREREQUISITE:	**ITCS 224 & ITCS 209**
NQF Level Allocated:	**Level 7**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

DESCRIPTION:

The course covers classical techniques and paradigms used in the design and analysis of algorithms. Some of the covered techniques are induction and recursion, divide and conquer, dynamic programming, and greedy approach. Techniques like backtracking and randomization are also introduced to deal with NP-Complete problems. Students will be able to practice their skills on many well-known algorithms and data structures designed to solve practical problems.

OBJECTIVES:

1. To introduce the specialist theories, concepts and principles of problems and algorithms design.
2. To design efficient algorithms for solving different kinds of problems using various classical techniques and paradigms.
3. To analyze the time and space complexities of algorithms.
4. To introduce computability and complexity theories, and study a number of techniques for solving hard problems.

SEMESTER: **ACADEMIC YEAR:**

INSTRUCTOR:
OFFICE TEL.:
EMAIL:

INTENDED LEARNING OUTCOMES (ILOS)

Upon successful completion of the course, students should be able to:

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	Concepts and Theories: Demonstrate advanced knowledge and understanding of the concepts and specialist theories of algorithmic design and analysis, algorithm design paradigms, optimal algorithms, complexity theory, P and NP problems, etc.	Knowledge: theoretical understanding [Level 7]
A2	Contemporary Trends, Problems and Research: N/A	N/A
A3	Professional Responsibility: N/A	N/A
B. Subject-Specific Skills		**NQF Descriptor/ Level**
B1	Problem Solving: Identify real world problems and solve them by designing efficient algorithms.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]
B2	Modeling and Design: Develop formal definitions of real world problems, and design their efficient algorithmic solutions using different techniques, such as, divide and conquer, dynamic programming, and the greedy approach.	Knowledge: Practical Application [Level 7]
B3	Application of Methods and Tools: Apply a computer programming language to implement algorithms designed for solving real world problems.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]
C. Thinking Skills		**NQF Descriptor/ Level**
C1	Analytic: Critically analyze and evaluate the asymptotic performance of different algorithms, and find the best and optimal solution for a problem.	Generic Problem Solving & Analytical skills [Level 7]
C2	Synthetic: N/A	N/A
C3	Creative: Demonstrate ability to analyze and design efficient algorithm for solving new problems using different algorithmic techniques.	Generic Problem Solving & Analytical skills [Level 7]
D. General and Transferable Skills (Other Skills Relevant to Employability and Personal		**NQF Descriptor/ Level**
D1	Communication: Show ability to convey ideas and describe processes of designing efficient algorithms in appropriate oral and written forms.	Communication, ICT and Numeracy Skills [Level 7]
D2	Teamwork and Leadership: Work effectively as a member/leader of a team who may plan, design, and implement an algorithm for solving real world problem.	Competence: Autonomy, Responsibility and Context [Level 7]

D3	Organizational and Developmental Skills: Demonstrate ability to utilize ideas of classical algorithms to develop procedures and processes to solve real world problems and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 7]
D4	Ethical and Social Responsibility: N/A	

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	2	2	A1	**Introduction to problems:** Types and sizes of problems, problem search space and instances.	Lecture/ In-Class Supervised Work	
2	2	2	A1, B2	**Problem Formulation and Modeling**	Lecture/ Lab Demonstration/ In-Class Supervised Work	In-Class Exercises
3	2	2	A1	**Algorithm Analysis:** Best, worst and average cases, asymptotic analysis.	Lecture/ Lab Demonstration	
4	2	2	A1, C1	**Algorithm Analysis:** Asymptotic notations.	Lecture/ In-Class Supervised Work/ Lab Demonstration (program execution time)	In-Class Exercises/ Quiz 1
5-6	4	4	A1, B1, B2, B3, C1	**Divide and Conquer:** Problem solving such as sorting problems.	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	In-Lab Exercises/ In-Class Exercises/ Quiz 2
7-8	4	4	A1, B1, B2, B3, C1	**Data Structures:** Heaps, operations on heaps and Heap Sort.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	Major Test / In-Lab Exercises/ In- Class Exercises
9-10	4	4	A1, B1, B2, B3, C1	**Greedy Approach:** Problem solving such as MST, Prim's and Kruskal's Algorithms.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	Quiz 2/ In-Lab Exercises/ In-Class Exercises

11-12	4	4	A1, B1, B2, B3, C1	**Dynamic Programming:** Problem solving, such as shortest paths problem and knapsack problem.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	Quiz 3/ In-Lab Exercises/ In-Class Exercises
13	2	2	A1, B1, B2, B3, C1	**Complexity Theory:** P, NP, NP-complete problems and Exhaustive search.	Lecture/ Lab Demonstration	In-Lab Exercises
14	2	2	A1, B1, B2, B3, C1	**Coping with NP-complete:** Backtracking, branch, bound and randomization, parallelization.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
15	2	2	B1, B2, B3, C1, C3, D1, D2, D3	Student Projects	Project Supervision	Evaluation of Project Presentations and Reports
16	2	-	A1, B1, B2, C1, C3	All Topics		Final Exam

TEACHING MATERIALS:

TEXTBOOK(S):

1. Sandeep Sen , Amit Kumar. (2019) *Design and Analysis of Algorithms: A Contemporary Perspective*, 1st Edition, Cambridge University Press, ISBN: 978-1108496827.

HANDOUT(S):   Available on Moodle i.e. http://www.ahlia.edu.bh/moodle

REFERENCE(S):
1. Dormehl L. (2015) *The Formula: How Algorithms Solve All Our Problems-And Create More*, WH Allen, TarcherPerigee; Reprint edition. ISBN: 978-0399170546.
2. Weiss M. A. (2012) *Data Structures and Algorithm Analysis in Java*, 3rd Edition, Pearson Education.
3. Wayne K. and Sedgewick R. (2014) *Algorithms*, 4th Edition, Addison-Wesley Professional.
4. Sedgewick R. and Flajolet P. (2013) *An Introduction to the Analysis of Algorithms*, 2nd Edition, Addison-Wesley.
5. Levitin A. (2014) *Introduction to the Design & Analysis of Algorithms*, 3rd Edition, Pearson Education.

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
Quizzes	Three written quizzes to be conducted. The quizzes consist mainly of problem solving and analysis questions. Average of best two will be considered.	A1, B1, B2, C1	10%
Project	Student will work as groups of 2-4 members; they will choose a real world problem, analyze it, design an algorithm, implement it and evaluate the performance.	B1, B2, B3, C1, C3, D1, D2, D3	20%
In-Class Exercises	Exercises cover problem solving and analysis questions to help the students in differentiating between the various algorithm designs.	B1, B2, C1	Formative
In-Lab Exercises	Implement the algorithms for solving problems.	B3	Formative
Major Test	In-class One test that will consist of short-answer, essay, problem solving, and algorithm analysis and design questions.	A1, B1, B2, C1	30 %
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay, problem-solving, algorithm analysis and design questions.	A1, B1, B2, C1, C3	40%
Overall			**100%**

Admissions	
Minimum number of students	**5**
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 IT

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

Course Code & Title: **ITCS 313 – Software Engineering I**

Weight: **(2-2-3)**

Prerequisite: **ITCS 201**

NQF Level Allocated: **7**

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

Description: This course is to give a clear understanding of the concepts of software engineering. It imparts knowledge of developing a software system from scratch, different software process models, software requirement engineering, and software design with object oriented technology using UML.

Objective:

1.   To understand software process models and how to select the suitable model to be used in software development.
2.   To develop the skills to gather different kinds of user requirements, various requirements modeling techniques, and requirements verification and validation.
3. To explain the process of object oriented design, and modeling techniques using UML.
4. To translate a requirements specification into an implementable design, following a structured and organized process.
5.   To help students gain experience of working as a member of a software engineering project team.

Semester:

Instructor (s):

Office Telephone: **EXT:**   **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate advanced knowledge and understanding of the software engineering concepts such as software development process and life cycle, object-oriented design methodology.	Knowledge: theoretical understanding [Level 7]
A2	**Contemporary Trends, Problems and Research: N/A**	
A3	**Professional Responsibility: N/A**	
B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Identify real world problems, elicit the requirements of stakeholders, design solutions, and test them against user requirements.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]
B2	**Modeling and Design:** Model using UML and design a computer-based system architecture, process and component needed to solve real world problem.	Knowledge: Practical Application [Level 7]
B3	**Application of Methods and Tools:** Apply the appropriate Computer Aided Software Engineering (CASE) tools to model and design computer software effectively.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]
C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Critically analyze a problem, identify needs and define the computing requirements appropriate to its solution.	Generic Problem Solving & Analytical skills [Level 7]

C2	**Synthetic:** Review, and extend knowledge and skills in software development to construct and reuse the multiple components of software.	Generic Problem Solving & Analytical skills [Level 7]
C3	**Creative: N/A**	

	D. General and Transferable Skills (other skills relevant to employability and personal development)	**NQF Descriptor/ Level**
D1	**Communication:** Organize and relate ideas effectively, in written, oral, and graphical form.	Communication, ICT and Numeracy Skills [Level 7]
D2	**Teamwork and Leadership:** Function and work effectively as member/leader of a software development project team.	Competence: Autonomy, Responsibility and Context [Level 7]
D3	**Organizational and Developmental Skills:** Demonstrate the ability to effectively manage and allocate appropriate time to develop computer software.	Competence: Autonomy, Responsibility and Context [Level 7]
D4	**Ethical and Social Responsibility: N/A**	

Course Structure (Outline)

Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1	**Introduction**: -Software Engineering -Software Engineering Problems.	Lecture	
2	2	2	A1	**Software Development Life Cycle**	Lecture/ Class Discussion	
3	2	2	A1, C1	**Software Process Models**	Lecture/ In-Class supervised Work	Quiz 1/ Case Study
4	2	2	A1, B1, C1	**Software Analysis Phase:** -Requirements Engineering process. -Requirements Elicitation. -Types of Requirements. -Fishbone Diagram	Lecture/ In-Class Supervised Work/ Lab Demonstration	In-Class Exercises
5	2	2	B2, B3, C1	**Software Analysis Phase:** -Business Process. -Functional Modeling. -DFD. -Use Case Diagrams.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	In-Lab/ In-Class Exercises/ Quiz 2
6	2	2	B2, B3, C1	**Software Analysis Phase:** Business Process Modeling With Activity Diagrams.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	In-Class/ In-Lab Exercises

7	2	2	B2, B3, C1	**Software Analysis Phase:** -Structured Modeling. -CRC Cards.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	In-Class/ In-Lab Exercises
8	2	2	A1, B2, B3, C1	**Software Analysis Phase:** Class Diagram.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	In-Lab Exercises/ Quiz 3
9	2	2	A1, B2, B3, C1	**Software Analysis Phase:** Behavioral Modeling.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	Major Test
10	2	2	A1, B2, B3, C1	**Software Analysis Phase:** Interaction Diagram.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	In-Class/ In-Lab Exercises
11	2	2	B2, C2	**Software Design Phase:** Evolving The Analysis Models into Design Models.	Lecture/ In-Class Supervised Work	In-Class Exercises
12	2	2	B1, B2, C2	**Software Design Phase:** Class and Method Design.	Lecture/ In-Class Supervised Work	In-Class Exercises

13	2	2	B1, B2, C1, C2	**Software Design Phase:** User Interface Design and Dialog Diagram.	Lecture/ In-Class Supervised Work	In-Class Exercises
14	2	2	B1, B2, C1, C2	**Software Design Phase:** Architecture Design.	Lecture/ In-Class Supervised Work	Case Study
15	2	2	B1, B2, B3, C1, C2, D1, D2, D3	Student Projects	Projects Supervision	Evaluation of Project Presentation and Report
16	2	-	A1, B1, B2,	All Topics		Final Exam

* Formative assessment

Teaching Materials:

Textbook(s):	1. Tagarden D. and Dennis A. (2015) *Systems Analysis and design with UML*, 5th Edition, Wiley. 2. Sommerville I. (2015) *Software engineering*, 10th Edition, Pearson.
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Pressman R. and Maxim B. (2019) Software Engineering: A Practitioner's Approach, 9th Edition, McGraw-Hill, ISBN: 978-1260548006. 2. Bruegge B. and Dutoit A. H. (2013) Object-Oriented Software Engineering: Using UML, Patterns and Java, 3rd Edition, Pearson. 3. Bennett S., McRobb S. and Framer R. (2010) Object-Oriented System Analysis and Design using UML, 4th Edition, McGraw Hill. 4. More references are available in the course website on Moodle.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
In-Lab Exercises	Each of the In-Lab exercises consist of a set of practical tasks to be implemented by students individually in class, as shown in the above weekly structure. Students work will be observed and graded directly during the lab sessions.	B3	10%
In-Class Exercises	In-class exercises consist of problem modeling and solving.	B2, C1	Formative
Case Studies	Different software development project cases are analyzed and studied.	C1	Formative
Quizzes	The purpose of the quiz is to assess the students' knowledge and understanding of concepts, principles and specialist theories of the topics. Students will be given three quizzes, best two will be considered.	A1	10%
Major Test	The test will be an in-class 90 minutes exam that will consist of short-answer, essay, problem solving, and analysis questions and cover the topics studied in the first 8 weeks.	A1, B1, B2, C1	20%
Project	Starting from weak 4, the class will be divided into teams of 2-3 students where each team will be asked to develop software of good characteristics. In this project the students will be able to analyze problems and specify requirements, model and design software using UML.	B1, B2, B3, C1, C2, D1, D2, D3	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.	A1, B1,B2, C1, C2	40%
Overall:			**100 %**

Admissions	
Minimum number of students	5
Maximum number of students	20

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COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY

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

CODE& TITLE:	**ITCS 323 – Database Systems: Design and Application**
WEIGHT:	**(2 - 2 - 3)**
PREREQUISITE:	**ITCS 222**
NQF Level Allocated:	**7**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

DESCRIPTION: This course provides a comprehensive knowledge of database (DB) development and management by using database management systems (DBMS). It details the concepts necessary for designing, implementing and using database systems. Topics include database and file system, database design, relational data model, normalization of relations and data modeling using entity-relationship diagrams.

OBJECTIVES:

1. To explain the characteristics that differentiates programming with data file approach from database approach.
2. To cite the goals, functions and models of database system.
3. To demonstrate knowledge of database management systems together with its functions and architecture.
4. To explain data modeling using EERD.
5. To recognize and describe the relational model, its terminologies and properties of database relations.
6. To design efficient and normalized database tables.
7. To explain concepts of conceptual and logical database design.
8. To demonstrate proficiency in using declarative query language, i.e. Structured Query Language to design, build and implement relational database.

SEMESTER: **ACADEMIC YEAR:**
INSTRUCTOR:
OFFICE TEL:
EMAIL:

INTENDED LEARNING OUTCOMES (ILOs)

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	Concepts and Theories: Demonstrate an understanding of advanced concepts, principles and theories related to designing, implementing and using both Database and Database Management System.	Knowledge: theoretical understanding [Level 7]
A2	Contemporary Trends, Problems and Research: N/A	N/A
A3	Professional Responsibility: N/A	N/A
B. Subject-Specific Skills		**NQF Descriptor/ Level**
B1	Problem Solving: Identify and analyze real life information management problems in order to solve them by developing efficient database systems.	Knowledge: Practical Application [Level 7]
B2	Modeling and Design: Model business data using EER and relational models and design database systems to meet user needs.	Knowledge: Practical Application [Level 7]
B3	Application of Methods and Tools: Apply modern DB design and implementation tools such as (Power Designer) and Microsoft SQL Server.	Knowledge: Practical Application [Level 7] Communication, ICT and Numeracy Skills [Level 7]
C. Thinking Skills		**NQF Descriptor/ Level**
C1	Analytic: Analyze the efficiency of databases systems developed for solving real world problems by applying the normalization rules and implementing the best practices in database design and modeling.	Generic Problem Solving & Analytical skills [Level 7]
C2	Synthetic: Demonstrate ability to combine the entities into a unified database design.	Generic Problem Solving & Analytical skills [Level 7]
C3	Creative: NA	N/A
D. General and Transferable Skills Development)		**NQF Descriptor/ Level**
D1	Communication: The ability to express and communicate ideas in oral and written form.	Communication, ICT and Numeracy Skills [Level 7]
D2	Teamwork and Leadership: Work effectively as a member/leader of a team who may plan and design the database	Autonomy, Responsibility and Context [Level 7]
D3	Organizational and Developmental Skills: Demonstrate ability to organize ideas and effectively allocate time in given assignment or project.	Competence: Autonomy, Responsibility and Context
D4	Ethical and Social Responsibility: N/A	N/A

	Course Structures (Outline)					
Week	**Hours**			**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
	Lecture	**Lab**	**ILOs**			
1	2	2	A1, B3	Syllabus, Introduction and lab demonstration	Lecture/ Lab Demonstration	
2	2	2	A1, B3, C1	**Introduction to Databases:** - Introduction. - Traditional File-Based Systems - Database Approach. - Advantages &disadvantages of DBMSs. **Lab:** - File-based approach.	Lecture/ In-Lab Supervised Work/ Class Discussion	Oral Participation / In-Lab Exercises
3	2	2	A1, B3	**Database Environment:** - The Three-Level ANSI-SPARC Architecture. - Database Languages. - Data Models and Conceptual Modeling. - Functions of a DBMS. **Lab:** - Database implementation using Access.	Lecture/ Lab Demonstration / In-Lab Supervised Work	Oral Participation / Quiz 1
4	2	2	A1, B2, B3	**The Relational Model:** - Terminology. - Integrity Constraints. - Views. **Entity Relationship Modeling:** - Entity Types. - Relationship Types.	Lecture/ In- Lab Supervised Work	Oral Participation / In-Lab Exercises
5-7	6	6	A1, B1, B2, B3	**Entity Relationship Modeling:** - Strong and Weak Entity Types. - Attributes on Relationships. - Structural Constraints. - Problem with ER Model. **Lab: SQL DML** - SQL SELECT Statement - Using Single-Row Functions to Customize Output. - Using Conversion Functions and Conditional Expressions - Working with Power Designer for ER Diagram.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	In-Class Exercises / In-Lab Exercises/ Quiz 2 (week7)

Week			Outcomes	Topics	Teaching Strategies	Assessment Methods
8-9	4	4	B1, B2, B3, C1, C2, D3	**Enhanced Entity Relationship Modeling:** - Specialization/Generalization. - Aggregation. - Composition. **Lab: SQL DML** - Displaying Data from Multiple Tables. - Using Subqueries to Solve Queries.	Lecture/ In-Lab Supervised Work / In-Class Supervised Work	In-Lab Exercises / In-Class Exercises / Assignment 1
10-11	4	4	A1, B1, B2, B3, C1	**Relational Algebra** **Lab** - Structured Query Language.	Lecture/ In-Lab Supervised Work / In-Class Supervised Work	In-Lab Exercises / In-Class Exercises/ Major Test(week10)
12-13	4	4	A1, B1, B3, C1, D3	**Normalization:** - The purpose of Normalization. - How Normalization Supports Database Design. - Data Redundancy and Update Anomalies. - Functional Dependencies. - The process of Normalization (1 NF, 2 NF, and 3 NF). **Lab:** - Structured Query Language. - Using DDL Statement Create and Manage Tables.	Lecture/ In-Lab Supervised Work / In-Class Supervised Work	In-Lab Exercises/ Assignment 2 / Quiz 3 (week13)
14	2	2	A1, B1, C1	**Selected Database Issues: Security and Administration** - Efficient Entity Design. - Database Security. - Countermeasures Computer-Based Controls. **Lab:** - Structured Query Language.	Lecture/ In-Class Supervised Work	In-Class Exercises/ In-Lab Exercises
15	2	2	B1, B2, B3, C1, C2, D1, D2, D3	**Student Projects**	Project Supervision	Evaluation of Project Presentation and
16	2		A1, B1, B2, C1, C2	All Topics		Final Exam

TEACHING MATERIALS:

TEXTBOOK(S):   Connolly T. and Begg C. (2015) *Database Systems, A practical Approach to Design, Implementation, and Management*, 6th Edition, Pearson.

HANDOUT(S):   Available on Moodle i.e. http://www.ahlia.edu.bh/moodle

REFERENCE(S):
1. Elmasri R. and Navathe S. (2016) *Fundamentals of Database Systems*, 7th Edition, Pearson, ISBN: 978-1292097619.
2. Coronel C. and Morris S. (2017) *Database Systems Design, implementation and Management*, 13th Edition, Cengage Learning.
3. Kroenke D. and Auer D. (2015) *Database Concepts*, 7th Edition, Pearson.
4. Molina H., Ullman, J. and Widom, J. (2013) *Database Systems: The Complete Book*, 2nd Edition, Pearson.

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
Quizzes	Three written quizzes to be conducted with different question types like: MC, and short-answer. Each quiz is for 30 minutes. The average of best two quizzes will be considered.	A1	5%
Assignments	Assignment to be given to students, worth five marks. The assignment will assess students' skills in modeling, designing a database.	B1, B2, C2, D3	5%
Project	Project consisting of several phases in which the student should design, normalize and implement a DB for an information system of his/ her choice.	B1, B2, B3, C1, C2, D1, D2, D3	20%
Major Test	The major test is a written, in-class 90 minutes test. It will cover topics studied in the first 9 weeks. The test will include several types of questions such as: short-answer, and design and modeling.	A1, B1, B2, C1	20%
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It will consist of design and modeling, short-answer and essay questions.	A1, B1, B2, C1, C2	40%
In-Class Exercises	Exercises cover design, modeling and normalization of a database.	B2, C1	Formative
In-Lab Exercises	To assess students skills in using different tools for implementing data base.	B1, B3	10%

	In-class participation and discussion will assess student understanding of several data base concepts and theories.	A1	Formative
Oral Participation			
Overall			**100%**

Admissions	
Minimum number of students	**5**
Maximum number of students	**20**

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COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
<u>**COURSE SYLLABUS/ SPECIFICATION**</u>

Course Code & Title:	**ITCS 327 – Software Engineering II**
Weight:	**(3-0-3)**
Prerequisite:	**ITCS 313**
NQF Level Allocated:	**7**

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

Description: The aim of this course is to hone skills in developing and testing of code, executing a program, and improving software's performance or locating certain types of faults. Students actively participate in the main software development activities that straddle the production of an initial implementation and the delivery of the complete system. The following topics are covered: software implementation, software testing in the broader context of software engineering, Software Quality that testing aims to achieve, Control flow testing, and Data flow testing.

Objective:

1. To critically understand the definitions of software implementation, testing and software qualities.

2. To demonstrate the types of various software testing techniques.

3. To understand the importance of considering static techniques for the assessment of software work product.

4. To apply the principal approaches to software testing, together with their associated techniques.

5. To critically understand implementation patterns, coding style and standard to produce quality code.

Semester:

Instructor (s):

Office Telephone: **EXT:**   **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate advanced knowledge and understanding of essential facts, concepts and specialist theories relating to the implementation, testing, and software quality.	Knowledge: theoretical understanding [Level 7]
A2	**Contemporary Trends, Problems and Research: N/A**	N/A
A3	**Professional Responsibility: N/A**	N/A
B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Solve the problems of software implementation, installation, and quality using advanced specialized techniques.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]
B2	**Modeling and Design:** Design test cases for testing software quality characteristics, such as effectiveness, reliability and accuracy.	Knowledge: Practical Application [Level 7]
B3	**Application of Methods and Tools: N/A**	N/A
C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Critically analyze software problems, identify what to test and choose the test conditions using test cases.	Generic Problem Solving & Analytical skills [Level 7]
C2	**Synthetic: N/A**	N/A
C3	**Creative:** Demonstrate creativity in the development of effective software testing cases for producing reliable, accurate and compatible software.	Generic Problem Solving & Analytical skills [Level 7]

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Show the ability to communicate clearly to convey complex information and ideas in appropriate oral and written forms.	Communication, ICT and Numeracy Skills [Level 7]
D2	**Teamwork and Leadership: N/A**	**N/A**
D3	**Organizational and Developmental Skills:** Demonstrate the ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 7]
D4	**Ethical and Social Responsibility:** Demonstrate an understanding and adhere to the ethical, legal and professional issues and significant responsibilities pertaining to software testing.	Competence: Autonomy, Responsibility and Context [Level 7]

Course Structure (Outline)

Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec.	Lab				
1	3		A1	**Introduction to Software Engineering II**	Lecture/ Class Discussion	
2	3		A1, B1	**Software Implementation and Installation**	Lecture/ Class Discussion	Case Study
3	3		A1	**Software Testing:** Basic Concepts A Software Testing Lifecycle.	Lecture/ Class Discussion	Quiz1
4	3		A1, B1	**Testing throughout t** V-Model.	Lecture/ In-Class Supervised Work	In-Class Exercises
5	3		A1, B1	**Static Techniques:** Review Process Inspection.	Lecture/ In-Class Supervised Work	In-Class Exercises
6	3		A1, B1, B2, C1	**Control Flow Testing:** Statement Coverage.	Lecture/ In-Class Supervised Work	In-Class Exercises

7	3		B1, B2, C1, C3, D1, D3	**Control Flow Graphs:** Branch Coverage.	Lecture/ In-Class Supervised Work	Assignment 1
8	3		A1, B1, B2, C1	**Control Flow Coverage**: Path Coverage.	Lecture/ In-Class Supervised Work	Quiz 2
9	3		B1, B2, C1	**Data-Flow Testing:** Data-Flow Graph.	Lecture/ In-Class Supervised Work	In-Class Exercises
10	3		B1, B2, C1	**Data-Flow Testing:** Data Flow Coverage	Lecture/ In-Class Supervised Work	Major Test
11	3		B1, B2, C1	**Mutation Testing**	Lecture/ In-Class Supervised Work	In-Class Exercises
12	3		A1, C1	**Unit Testing:** Static Unit Testing,	Lecture/ In-Class	In-Class Exercises
				Dynamic Unit Testing.	Supervised Work	
13	3		A1, B1, B2, C1, D4	**Integration Testing**: System Testing.	Lecture/ In-Class Supervised Work	Quiz 3
14	3		A1, B1, B2, C1, D1, D3, D4	**Acceptance Testing:** Types of Acceptance Testing.	Lecture/ Independent Learning	Assignment 2
15	3		A1, B1, C1	**Software Quality:** Software Quality Standard.	Lecture/ In-Class Supervised Work	Case Study
16	2		A1, B1, C1	**All Topics**		Final Exam

Teaching Materials:

Textbook(s):	1. Brian Hambling, Peter Morgan, Angelina Samaroo, Geoff Thompson, Peter Williams (2019) *Software Testing: An ISTQB-BCS Certified Tester Foundation guide,* 4th Edition. BCS, Chartered Institute for IT. 2. Spillner A., Linz T. and Schaefer H. (2014) Software Testing Foundations, 4th Edition, ISTQB certification Compliant.
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Aditya M.P. (2014) *Foundations of Software Testing*, 2nd Edition, Addison- Wesley. 2. Tagarden D.P. (2015) *Systems Analysis and design with UML*,5th Edition International Student Version, Wiley. 3. SommervilleI. (2015) *Software engineering*, 10th Edition, Addison Wesley. 4. Ammann P. and Offutt J. (2016) *Introduction to Software Testing*, 2nd Ed. Cambridge University Press. 5. Naik K. and Tripathy P. (2011) *Software Testing and Quality Assurance: Theory and Practice,* John Wiley & Sons. 6. Mili A. and Tchier F. (2015) Software *Testing: Concepts and Operations*, John Wiley & Sons. 7. Hoffer J. A., George J. and Valacich J. A. (2016) *Modern Systems Analysis and Design,* 8th Edition, Pearson.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Assignments	The assignment consists of essay, problem-solving and research based theoretical questions regarding topics in software testing. The purpose of the assignment is to assess students where they have to demonstrate their extensive and detailed knowledge and critical understanding of key concepts of software testing. Students will be given two assignments (each worth 10%).	B1, B2, C1, C3, D1, D3, D4	20%
Major Test	The test will be an in-class 90 minutes exam that will consist of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks.	A1, B1, B2, C1	30%
	The quizzes will consist of MCQs,		

Quizzes	and short-answer questions. The purpose of the quiz is to assess the students' knowledge and understanding of key concepts, principles and theories of software testing. Students will be given three quizzes and best two will be considered.	A1	10%
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, B1, B2, C1, D4	40%
Case Studies	Different software project cases are analyzed and studied.	C1, D4	Formative
In-Class Exercises	In-class exercises consisting mainly of problem solving questions.	B1, B2	Formative
Overall:			**100 %**

Admissions	
Minimum number of students	**5**
Maximum number of students	**25**

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

Course Code & Title: ITCS 335 - IT Infrastructure

Weight: (2 – 2 – 3)

Prerequisite: ITCS 214

NQF Level Allocated: 7

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

Description:

This course provides the fundamental networking skills required to deploy and support Network Operating System (NOS) in most organizations. It covers IP fundamentals, remote access technologies, and more advanced content including Software Defined Networking. This course is intended for existing IT professionals who have some networking knowledge and experience and are looking for a single course that provides insight into core and advanced networking technologies in NOS.

Objectives:

1. To critically understand, plan and implement IPv4 network, DHCP, IPv6, DNS, IPAM, Direct Access and VPN.
2. To gain expertise in implementing networking for branch offices, Software Defined Networking, network virtualization, and Network Controller.
3. To be competent in planning networks and remote access.
4. To develop the skills to configure advanced networking features, and advanced Microsoft Hyper-V networking features
5. To help students gain experience of working as a member of a networking team.

Semester:

Instructor(s):

Office Telephone: **Email (s):**

1

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Recognize advanced concepts and principles related to IT infrastructure solution, such as clients, servers, network devices, wired and wireless network.	Knowledge: theoretical understanding [Level 7]
A2	**Contemporary Trends, Problems and Research:** N/A	N/A
A3	**Professional Responsibility:** N/A	N/A
B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Use advanced level skills to evaluate and select an integrated IT infrastructure (hardware, software, architectures, and services) to best fulfill a real life organizational requirements	Knowledge: Practical Application [Level 7]
B2	**Modeling and Design:** N/A	N/A
B3	**Application of Methods and Tools:** Apply advanced tools and techniques to plan and implement a computer network.	Knowledge: Practical Application [Level 7]
C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Analyze an existing IT infrastructure, identify its strengths and weaknesses, and develop a roadmap for future evolution.	Generic Problem Solving & Analytical skills [Level 7]
C2	**Synthetic:** Identify and diagnose basic computer communication problems and to develop the necessary strategies to work towards their resolution	Generic Problem Solving & Analytical skills [Level 7]
C3	**Creative Thinking and innovation:** N/A	N/A
D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:**	N/A
D2	**Teamwork and Leadership: Operate an advanced level and** work collaboratively in a team to complete a task.	Competence: Autonomy, Responsibility and Context

		[Level 7]
D3	**Organizational and Developmental Skills:** Demonstrate accountability to organize ideas and effectively allocate time in given assignment or project	Competence: Autonomy, Responsibility and Context [Level 7]
D4	**Ethics and Social Responsibility:** N/A	N/A

Course Structure (Outline)

Week	Hours Lect. - Lab	ILOs	Topics	Teaching Method	Assessment Method
1	4 - 0	A1	Introduction to computer networks, the definition of IT infrastructure and IP addressing basics.	Lecture/ In-Class Supervised Work	In-Class Exercises
2	2 - 2	B1, B3	Planning IPv4 network, Configuring an IPv4 host, Managing and troubleshooting IPv4 network connectivity	Lecture/ In-Lab Supervised Work	In-Lab Exercises
3	2 - 2	B1, B3, C1, C2, D2, D3	Planning the IPv4 address assignments, Verifying IPv4 and Troubleshooting IPv4 Implementing and troubleshooting an IPv4 network	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Assignment I
4	2 - 2	A1, B1, B3, C1, C2	Overview of the DHCP server role, Deploying DHCP, Managing and troubleshooting DHCP Implementing DHCP	Lecture/ In-Lab Supervised Work	In-Lab Exercises
5	2 - 2	B1, B3	Planning a DHCP server implementation, Implementing the DHCP configuration, Validating the DHCP implementation	Lecture/ In-Lab Supervised Work	In-Lab Exercises
6	2 - 2	A1, B1, B3	Overview of IPv6 addressing, Configuring an IPv6 host, Implementing IPv6 and IPv4 coexistence,	Lecture/ In-Lab Supervised Work	In-Lab Exercises
7	2 - 2	B1, B3, C1, C2	Transitioning from IPv4 to IPv6, Configuring and evaluating IPv6 transition technologies	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Lab Test I
8	2 - 2	B1, B3	Implementing DNS servers, Configuring zones in DNS, Configuring name resolution between DNS zones	Lecture/ In-Lab Supervised Work	In-Lab Exercises

9	2 - 2	B1, B3, D2, D3	Configuring DNS integration with Active Directory Domain Services (AD DS) Planning and implementing name resolution by using DNS	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Assignment II
10	2 - 2	A1, B1, B3, C1, C2	Overview of IPAM, Deploying IPAM. Managing IP address spaces by using IPAM Implementing IPAM Installing the IPAM Server feature, Provisioning the IPAM Server, Managing IP address spaces by using IPAM	Lecture/ In-Lab Supervised Work	In-Lab Exercises
11	2 - 2	A1, B1, B3	Overview of remote access, Implementing the Web Application Proxy, Implementing Web Application Proxy, Validating the Web Application Proxy deployment	Lecture/ In-Lab Supervised Work	In-Lab Exercises
12	2 - 2	A1, B1, B3, C1, C2	VPN concepts, Planning VPNs, Implementing VPNs, Validating the VPN deployment, Troubleshooting VPN access	Lecture/ In-Lab Supervised Work	In-Lab Exercises
13	2 - 2	A1, B1, B3, C1, C2	Networking features and considerations for branch offices, Implementing Distributed File System (DFS) for branch offices, Implementing BranchCache for branch offices	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Lab Test II
14	2 - 2	A1, B1, B3, D2, D3	Overview of high performance networking features, Configuring advanced Microsoft Hyper-V networking features	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Assignment III
15	2 - 2	A1, B1, B3	Overview of SDN,	Lecture/	

			Implementing network virtualization, Implementing Network Controller	In-Lab Supervised Work	
16	2 - 0		All Topics		Final Exam

Teaching Materials:

Textbook(s):	Greg Tomsho, (2018), MCSA Guide to Networking with Windows Server 2016, Exam 70-741, Cencage Learning, ISBN: 978-1337400787
Handout(s):	- Internal handouts (Hardcopies) prepared by course instructors. - PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	- Laan, S., (2017). IT Infrastructure Architecture-Infrastructure Building Blocks and Concepts Third Edition. Lulu. com. - Comer, Douglas E., (2018) The Internet book: everything you need to know about computer networking and how the Internet works. CRC Press, 2018. ISBN-13: 978-1138330290. - Drago Hercog (2020), Communication Protocols: Principles, Methods and Specifications 1st ed. 2020 Edition. Springer.

Assessments:

Method of Assessment	Description	Learning Outcomes	Weighting
Assignments	Three group assignments to be given to students, each assignment worth 10 marks. The assignments contain several questions designed to help students consolidate the concepts learned.	A1, B1, B3, C1, C2, D2, D3	**30%**
Lab Tests	Two practical tests to be given to students during lab time where each will take two hours and worth 15 marks. The total of both tests will be considered at the end. The first test will cover topics from week 1 to 7 and the second test will cover topics from week 8 to 13.	B1, B3, C1, C2	**30%**
Final Exam	The final exam is a comprehensive, written exam and will be of 2 hours. It will assess students' knowledge and skills.	A1, B1, C1, C2	**40%**
In- Lab Exercises	In-Lab Exercises will allow the students to practice planning and implementing the covered topics.	B1, B3, C1, C2	**Formative**
		Overall	**100 %**

Admissions	
Minimum number of students	5
Maximum number of students	20

COURSE SYLLABUS/SPECIFICATION

CODE & TITLE:	**ITCS 336 – Database Administration I**
WEIGHT:	**(2 - 2 - 3)**
PREREQUISITE:	**ITCS 323**
NQL Level Allocated:	**7**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

DESCRIPTION: This course gives students advanced knowledge and expertise on administrating the industry's most advanced database (DB) management system. This includes: installing Database, controlling the databases, backup and recovery and administrating users' security.

OBJECTIVES:
1. To critically identify the tools for administrating a DB.
2. To deeply understand the different types of users, their roles and responsibilities.
3. To identify the types of failure that can occur in DB.
4. To deeply understand essential security-related aspect of DB and its users.

SEMESTER: **ACADEMIC YEAR:**
INSTRUCTOR:
OFFICE TEL:
EMAIL:

INTENDED LEARNING OUTCOMES (ILOS)

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories**: Demonstrate advanced understanding and knowledge of administrating Database.	Knowledge: Theoretical understanding [Level 7]
A2	**Contemporary Trends, Problems and Research**: N/A	
A3	**Professional Responsibility:** N/A	
B. Subject-Specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving**: Use advanced level skills to install, configure and maintain Database as well as manage its users.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]
B2	**Modeling and Design:** N/A	
B3	**Application of Methods and Tools**: Apply advanced and specialized tools to create, manage, and maintain databases.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]
C. Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic:** Critically evaluate DBMS applications and tools and choose the most appropriate one as per user requirements.	Generic Problem Solving & Analytical skills [Level 7]
C2	**Synthetic:** N/A	
C3	**Creative:** N/A	
D. General and Transferable Skills (Other Skills Relevant to Employability and Personal		**NQF Descriptor/ Level**
D1	**Communication:** Demonstrate the ability to express and communicate ideas in formal oral and written form.	Communication, ICT and Numeracy Skills [Level 7]
D2	**Teamwork and Leadership:** N/A	
D3	**Organizational and Developmental Skills**: Demonstrate accountability to organize ideas and effectively allocate time in a given assignment.	Competence: Autonomy, Responsibility and Context [Level 7]
D4	**Ethical and Social Responsibility:** N/A	

Course Structures (Outline)						
Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1	**Introduction** and syllabus distribution.	Lecture	
2	2	2	A1, B1, B3	**Introduction to SQL / PL-SQL** - SQL DML, DCL Commands - Declaring PL/SQL Variables -Writing Executable Statements	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
3	2	2	A1, B1, B3, C1	**PL/SQL Program** - Writing Control Structures - Working with Composite Data Types	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
4	2	2	A1, B1, B3, C1	**PL/SQL Program** - Using Explicit Cursors	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises Quiz - 1
5	2	2	A1, B1, B3, C1	**PL/SQL Program** - Creating Stored Procedures and Functions	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
6	2	2	A1, B3	**Oracle Environment** -Exploring the Oracle Database Architecture - Preparing the Database Environment -Creating an Oracle Database and Managing	Lecture/ Class Discussion / In-Lab Supervised Work	In-Lab Exercises Assignment 1
7	2	2	A1, B1, B3, C1	**Oracle Environment** -Configuring the Oracle Network Environment -Managing Database Storage Structures	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
8	2	2	A1, B1, B3, C1, D1, D3	**Oracle Environment** -Administering User Security -Managing Data and Concurrency	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
9	2	2	A1, B1, B3, C1,	**Oracle Environment** - Managing Undo Data	Lecture/ Class Discussion/ In-Lab	In-Lab Exercises

					Lecture/ Class Discussion/ In-Lab Supervised Work	
10	2	2	A1, B1, B3, C1	**Database Maintenance**	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
11	2	2	A1, B1, B3, C1	**Performance Management**	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Lab Test
12	2	2	A1, B1, B3, C1	**Intelligent Infrastructure Enhancements**	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Quiz 2
13	2	2	A1, B1, B3, C1, D1, D3	**Backup and Recovery Concepts**	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Assignment 2
14	2	2	B1, B3, C1	• **Performing Database Backups** • **Performing Database Recovery**	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
15	2	2	A1, B1, B3, C1	• **Moving Data** • **Working With Support**	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
16	2	-	A1, B1, C1	All Topics		Final Exam

TEACHING MATERIALS:

Textbook(s):	1- Bob Bryla (2015), *Oracle Database 12c DBA Handbook (Oracle Press),* McGraw-Hill Education, ISBN: 978-0071798785. 2- Bob Bryla & Kevin Loney (2014), *Oracle Database 12c The Complete Reference (Oracle Press),* McGraw-Hill Education, ISBN: 978-0071801751.
Handout(s):	1. Available on Moodle i.e. http://www.ahlia.edu.bh/moodle **2.** Oracle Learning Library available through: http://www.oracle.com/technetwork/tutorials/index.html
Reference(s):	1- Biju Thomas (2014) *OCA: Oracle Database 12c Administrator Certified Associate Study Guide: Exams 1Z0-061 and 1Z0-062*, 1st Edition BY. PUBLICATION: Sybex; 1 edition (May 12, 2014).

ISBN: 978-1118643952

2- https://docs.oracle.com/database/121/ADMIN/title.htm, (2017)

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
Assignments	The students will be given 2 research based assignments each worth 10 marks and their total will be considered at the end.	A1, B1, C1, D1, D3	20%
Quizzes	The purpose of the quiz is to assess the students' knowledge and understanding of the topics covered in the course like creating and managing Oracle database, configuring Oracle network environment, performing database backup and recovery, implementing database security. Students will be given two quizzes, each one is 30 minutes, and the best one will be considered.	A1, B1, C1	10%
Lab Test	The knowledge and practical skills of students will be evaluated throughout practical test that will be of 90 minutes. It will cover topics discussed in the first 10 weeks.	B1, B3, C1	30%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of multiple choice questions, fill in the blank, short-answer and few essay questions.	A1, B1, C1	40%
In-Lab Exercises	Each of the In-Lab exercises consists of a set of practical tasks to be carried by the students during lab time and that will help in evaluating hands-on capability of the students.	B1, B3, C1	Formative
Overall			**100%**

Admissions	
Minimum number of students	**5**
Maximum number of students	**20**

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

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

Course Code & Title:	**ITCS 341 - System Administration I**
Weight:	**(2-2-3)**
Prerequisite:	**ITCS 214**
NQF Level Allocated:	**Level 7**

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

Description: This course provides broad knowledge and experience for IT professional. Student will have the knowledge required to assemble components based on customer requirements, install, configure PCs and software for end users, and understand the basics of networking, properly and safely.

Objective:

1. To explain PCs, Laptops, printers & network hardware standards.
2. To explain Professional conduct & professional communications with clients.
3. To explain assembling, dissembling and installing PCs, laptops, printers & network cards, and expansion cards.

Semester:

Instructor:

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate detailed knowledge and understanding of computer components, peripheral devices and networking basic settings requirements.	Knowledge: theoretical understanding [Level 7]
A3	**Professional Responsibility:** Demonstrate advanced knowledge and understanding of the professional conducts for IT professionals.	Knowledge: theoretical understanding [Level 7]

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Show ability to install, configure and troubleshoot various hardware and device components.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level7]
B3	**Application of Methods and Tools:** Install and expand devices by adding additional equipment through the usage of different tools such as standard technician toolkit and maintenance kit.	Knowledge: Practical Application [Level 7] Skills: Communication, ICT & Numeracy [Level 7]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Compare and Contrast various configurations and choose the most appropriate as per user requirements as well as evaluate and select the appropriate component and operational procedures for a user configuration.	Generic Problem Solving & Analytical skills [Level 7]

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Express and communicate ideas in written and oral form.	Communication, ICT and Numeracy Skills [Level 7]
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 7]

Course Structure (Outline)

Week	Hours Lecture	Hours Lab	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-2	4	4	A1, B1, B3, C1	**- Syllabus, Introduction** **- Motherboards and expansion cards** 1. Differentiate between motherboard components and their purposes. 2. 2. Differentiate between expansion slots/ expansion cards and their properties	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
3	2	2	A1, B1, B3, C1	**CPUs and power supplies** 1. Differentiate among various CPU types and features and select the appropriate cooling method. **2.** Power supply: know connector types, their voltages and properties	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
4	2	2	A1, B1, B3, C1	**Memory and physical storage** Compare and contrast RAM types and features	Lecture/ Class Discussion/ In-Lab	In-Lab Exercises
5-6	4	4	A1, B1, B3, C1	**Connections** Compare and contrast various connection interfaces and explain their purpose.	Lecture/ Class Discussion/ In-Lab	In-Lab Exercises/ Quiz1(Week 6)
7	2	2	A1, B1, B3, C1	**Peripherals devices** Install and configure various peripheral devices like: input devices, output devices and multimedia devices	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises

8	2	2	A1, B1, B3, C1, D1, D3	**Printers** 1. perform printer maintenance 2. Install, and configure printers 3. Explain the differences between the various printer types and summarize the associated imaging process.	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Assignment 1
9	2	2	A1, B1, B3, C1	**Notebooks** 1. Compare and contrast laptop features. 2. Compare and contrast the components within the display of a laptop. 3. Install and configure laptop hardware and components.	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
10-11	4	4	A1, B1, B3, C1	**Networking Basics** Identify various types of networks**.**	Lecture/ Class Discussion/ In-Lab Supervised Work	Major Test (Week 11)
12	2	2	A1, B1, B3, C1	**The Physical Network** 1. Identify types of network cables and connectors. 2. Categorize characteristics of connectors and cabling. 3. Compare and contrast network devices, their Functions, and features.	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises

13	2	2	A1, B1, B3, C1	**Networking Protocols** 1. Explain properties and characteristics of TCP/IP. 2. Explain common TCP and UDP ports, protocols, and their purpose.	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
14	2	2	A1, B1, B3, C1	**Wireless Networking** Compare and contrast wireless networking standards and encryption types.	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Quiz2
15	2	2	A1, B1, B3, C1, D1, D3, A3	**Professional Conducts**	Lecture/ Class Discussion/	Assignment 2
16	2	-	A1, B1, C1, A3	**All Topics**		Final Exam

Teaching Materials:

Textbook(s):	1- Faithe Wempen, Jane Holcombe, (2019) *CompTIA A+ Certification Study Guide*, 10th Edition (Exams 220-1001 & 220-1002), McGraw-Hill Education, ISBN: 978-1260456653
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	https://certification.comptia.org/getCertified/certifications/a.aspx

Assessments:

Type of Assessment	Description	ILOs	Weighting
In-Lab Exercises	Each of the In-Lab exercises consists of a set of practical tasks to be carried by the students during lab time and that will help in evaluating hands-on capability of the students.	B1, B3	Formative

Quizzes	The purpose of the quiz is to assess the students' knowledge and understanding of the topics covered in the course like computer components, its peripherals and networking concepts. Students will be given two quizzes, each one is 30 minutes, and the best one will be considered.	A1, B1, C1	10%
Major Test	The test will be an in-class 60 minutes exam that will consist of multiple choice questions, fill in the blank, short-answer and few essay questions. It will cover the topics studied in the first 10 weeks.	A1, B1, C1	30%
Assignments	The students will be given 2 assignments each worth 10 marks and their total will be considered at the end.	B3, C1, D1, D3	20%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of multiple choice questions, fill in the blank, short-answer and few essay questions.	A1, B1, C1, A3	40%
Overall			**100%**

Admissions	
Minimum number of students	5
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 INFORMATION TECHNOLOGY

<u>COURSE SYLLABUS/ SPECIFICATION</u>

Course Code & Title: **ITCS 401 – Software Project Management**

Weight: **(2-2-3)**

Prerequisite: **ITCS 327**

NQF Level Allocated: **8**

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

Description: The course focuses on the key aspects of software project management. It develops the ability of managing software projects, including organizing the software development team; selecting the best approach and tailoring the process model; estimating software cost and schedule; planning and documenting the plan; risk management and resource allocation.

Objective:

1.   To explain the key components of a project plan.

2.   To explain roles and responsibilities for key project personnel and stakeholders.

3.   To explain the importance of a cost/benefit analysis to the successful implementation of a project plan.

4.   To critically understand project budgeting, scheduling, and evaluation.

5.   To prepare a project plan, as part of a team, for an IT project and demonstrate ability to follow standard project management methodology.

6.   To use appropriate project planning and tracking tools.

Semester:

Instructor (s):

Office Telephone: EXT: Email (s):

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of the process of developing and managing software projects.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** Recognize emerging aspects and trends in software project management.	Knowledge: theoretical understanding [Level 8]
A3	**Professional Responsibility:** Acquaint students with tasks undertaken during project management, tasks of each team member, and the skills needed for a project manager to lead his team.	Knowledge: theoretical understanding [Level 8]
B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Demonstrate the ability to estimate efforts, estimate budget, solve resource allocation together with project schedule problems and address any obstacles that may jeopardize the completion of projects.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design: N/A**	**N/A**
B3	**Application of Methods and Tools:** Apply appropriate project planning and tracking tools such as ROI, COCOMO, Gantt charts, CPM, PERT utilizing EXCEL and Microsoft Project.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Critically analyze project requirements in order to define the scope of work, conduct organizational planning, identify and evaluate risks and assess how well a project follows its project	Generic Problem Solving & Analytical skills

	plan.		[Level 8]
C2	**Synthetic:** Integrate various components of project plan to implement the project.		Generic Problem Solving & Analytical skills [Level 8]
C3	**Creative: N/A**		**N/A**
D. General and Transferable Skills (other skills relevant to employability and personal development)			**NQF Descriptor/ Level**
D1	**Communication:** Demonstrate ability to communicate information in appropriate oral and written forms to a variety of audience.		Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:** Function and work effectively as member/leader of 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 assignments and project.		Competence: Autonomy, Responsibility and Context [Level 8]
D4	**Ethical and Social Responsibility:** Predict and learn the impact of one's behavior on the work and colleagues in a software project management process.		Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)

Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lecture	Lab				
1	2	2	A1	**Course Overview & Introduction:** Why is Project Management Important?	Lecture/ Class Discussion	
2	2	2	A1	**Introduction to Software Project Management:** Characteristics of Projects	Lecture/ Class Discussion	
3-4	4	4	A1, B1, B3, C1	**Project Evaluation & Programme Management:** - The Business Case For a Project - Project Portfolios - Project Evaluation - Cost Benefit Analysis - Cash Flow Forecasting - Programme Management - Benefits Management	Lecture/ In-Class Supervised Work/ Lab Demonstration	In-Lab Exercise
5	2	2	A1, B1, C1	**Overview of Project Planning:** - Step Wise - Gantt Charts	Lecture/ In-Class Supervised Work	Case Study
6-7	4	4	A1, B1, C1, D1, D3	**Software Effort Estimation:** - What Makes a Successful Project - Estimating Methods	Lecture/ In-Class Supervised Work	Assignment1/ Case Study
8	2	2	A1, B1, B3, C1, C2	**Activity Planning:** - Scheduling - Activity Networks - PERT Diagram	Lecture/ In-Class Supervised Work/ Lab Demonstration	In-Lab Exercise/ Case Study

9-10	4	4	A1, B1, C1	**Risk Management:** - Definition of 'Risk' and 'Risk Management' - Some Ways of Categorizing Risk, Risk Management	Lecture/ In-Class Supervised Work	Case Study/ Major Test (Week 9)
11	2	2	A1, B1, B3	**Resource Allocation:** Resource Smoothing	Lecture/ Lab Demonstration	In-Lab Exercise
12	2	2	A1, A2, A3, D1, D3	**Managing Contracts,** - Types of Contracts - The Tendering Process	Lecture/ Independent Learning	Assignment2
13	2	2	A1, A3	**Managing Teams:** - Becoming a Team - Virtual Projects	Lecture/ Class Discussion	Case Study (Simulation)
14	2	2	A1, C1	**Software Quality** - The Importance Of Software Quality - ISO 9126 Software Qualities	Lecture/ In-Class Supervised Work	Case Study
15	2	2	A3, B1, B3, C1, C2, D1, D2, D3, D4	Student Projects	Project Supervision	Evaluation of Project Presentations and Reports
16	2	-	A1, A2, B1, C1, C2	All Topics		Final Exam

Teaching Materials:

Textbook(s):	1. Schwalbe K. (2019) *Information Technology Project management*, 9th Edition, Cengaged learning. 2. Anna P. Murray (2016) *The Complete Software Project Manager: Mastering Technology from Planning to Launch and Beyond*, Wiley, ISBN: 978-1119161837
Handout(s):	PowerPoint slides available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Hoffer J. A., George J. and Valacich J. A. (2016) *Modern Systems Analysis and Design,* 8th Edition, Pearson 2. Gray C. and Larson E. (2017) *Project Management The Managerial Process*, 7th Edition, McGraw-Hill 3. Alan Dennis, Barbara Haley Wixom, David Tegarden, (2012), *Systems analysis design, UML version 2.0 : An object oriented approach*, 4th Edition International Student Version, Wiley. 4. Hughes B. and Cotterell M. (2009) *Software Project Management*, 5th Ed., McGraw- Hill 5. Other references can be found on Moodle.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
In-Lab Exercise	Each lab exercise consists of a set of practical tasks to be implemented by students individually in lab times as shown in the above weekly structure. Students work will be observed and graded directly during the lab sessions.	B1, B3, C1	Formative Assessment
Case Studies	Different project management cases are analyzed, simulated and studied.	A3, B1, C1	Formative Assessment

Assignments	Two assignments, each worth 10%. The assignments consist of essay, problem-solving and research based questions covering topics in software project management. The purpose of the assignments is to assess students individually where they have to demonstrate their extensive and detailed knowledge and critical understanding of key concepts of software project management.	A2, B1, C1, D1, D3	20%
Major Test	The test will be an in-class 1-hour test that will consists of short-answer, essay, and problem solving questions and cover the topics studied in the first 9 weeks.	A1, B1, C1, C2	20%
Project	Starting from weak 4, the class will be divided into teams of 2-3 students where each team will be asked to develop a software project plan for an actual client. In this project, the team will work together and go through each of the steps in the Step Wise framework.	A3, B1, B3, C1, C2, 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.	A1, A2, B1, C1, C2	40%
Overall:			**100 %**

Admissions	
Minimum number of students	5
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).**

Course Code & Title: ITCS 404- Information Security Engineering

Weight: (2- 2 - 3)

Prerequisite: ITCS 327

NQF Level Allocated: 8

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

Description:

This course is to cover technical and administrative aspects of Information Security and Assurance. Topics covered: Information Security Concepts, The Need for Security, Security Services and Mechanisms, Security System Development, and Security Mechanisms, such as: Cryptographic systems, Information Hiding, Entity Authentication, and Digital Signature.

Objectives:

1. To critically understand the specialist theories, standards, and concepts of information security.
2. To understand the phases needed to develop security systems.
3. To understand the business needs for security.
4. To critically evaluate different security techniques for providing different security services.
5. Research on new trends in information security.

Semester: 1

Instructor (s): Dr. Wasan Awad

Office Telephone: 17298996   **Email (s): wawad@ahlia.edu.bh**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding	NQF Level
A1. Concepts and Theories: Demonstrate critical understanding of principles, standards, and concepts related to information security goals, mechanisms, and development.	Knowledge: theoretical understanding [Level 8]
A2. Contemporary Trends, Problems and Research: Demonstrate critical understanding of major current issues of information security, and research on new trends in protecting information.	Knowledge: theoretical understanding [Level 8]
A3. Professional Responsibility: N/A	N/A
B. Subject-Specific Skills	**NQF Level**
B1. Problem Solving: Critically analyze, assess, and identify the information security risks, vulnerabilities, threats, and possible attacks, as well as critically choose the appropriate security mechanisms to control security risks.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2. Modeling and Design: Design effective security systems to meet user requirements and to control information security risks of information systems.	Knowledge: Practical Application [Level 8]
B3. Application of Methods and Tools: Apply IT tools to implement different kinds of security techniques needed to protect information.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
C. Critical Thinking Skills	**NQF Level**
C1. Analytic: Critically assess, compare and select emerging and existing information security techniques, and analyze the security level of security systems.	Generic Problem Solving & Analytical skills [Level 8]
C2. Synthetic: Integrate appropriate information security components into one effective security system.	Generic Problem Solving & Analytical skills [Level 8]
C3. Creative: Demonstrate creativity in the development of effective security systems to control the problems of information systems.	Generic Problem Solving & Analytical skills [Level 8]
D. General and Transferable Skills	**NQF Level**
D1. Communication: Express and communicate complex ideas related to information security in written and oral forms.	Communication, ICT and Numeracy Skills [Level 8]
D2. Teamwork and Leadership: Demonstrate the ability to work as a group member/leader and share the ideas together.	Competence: Autonomy, Responsibility and

D3. Organizational and Developmental Skills: Demonstrate the ability to organize ideas and effectively allocate time in given assignments and project.	Competence: Autonomy, Responsibility and Context [Level 8]
D4. Ethical and Social Responsibility: Demonstrate an understanding of the role of culture as it applies to ethics in information security.	Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)

Course Structures						
Week	**Hours**		**ILOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	2	2	A1	**Introduction to Information Security:** • Definitions. • Critical Information Characteristics. • Security Model. • SDLC Overview.	Lecture/Class Discussion	
2	2	2	A1	**The Business Need for Security:** • Threats. • Attacks.	Lecture/Class Discussion	
3	2	2	A1, D4	**Legal, Ethical, and Professional Issues in Information Security**	Lecture/ Debate/ Independent Learning	Case Study
4-5	4	4	A1, B1, B3	**Risk Management:** • Asset Identification and Valuation. • Threat Identification. • Vulnerability Identification. • Risk Identification and Assessment. **Lab:** Vulnerability Identification	Lecture/ Lab Demonstration/ In-Class Supervised Work	In-Lab Exercises/ Case Study

6	2	2	A1, A2, B2, D1, D3	**Risk Management:** Controlling Risk. **Lab:** Data Backup and Recovery	Lecture/ Lab Demonstration/ Independent Learning	Assignment 1/ In- Lab Exercises
7	2	2	A1, B2	**Logic Design**	Lecture/ In-Class Supervised Work	
8-10	6	6	A1, A2, B2, B3, C1, D1, D3	**Physical Design:** Cryptography and Cryptanalysis. **Lab:** Implementation of cryptographic systems and attacking methods.	Lecture/ In-Class Supervised Work/ Lab Demonstration/ In-Lab Supervised Work/ Independent Learning	Major Test (week 10)/ In-Class Exercises/ In-Lab Exercises/ Assignment 2
11-12	4	4	A1, A2, B2, B3, C1, D1, D3	**Physical Design:** Entity Authentication. **Lab:** Implementation of Entity Authentication techniques.	Lecture/ In-Class Supervised Work/ Lab Demonstration/ Independent Learning	In-Class Exercises/ In-Lab Exercises/ Assignment 3
13	2	2	A1, B2, B3, C1	**Physical Design:** Message Authentication. **Lab:** Implementation of Message Authentication techniques.	Lecture/ In-Class Supervised Work/ In-Lab Supervised Work	In-Class Exercises/ In-Lab Exercises
14	2	2	A1, B2, B3, C1	**Physical Design:** Information Hiding.	Lecture/ Lab Demonstration/ Class Discussion	
15	2	2	A2, B1, B2, B3, C1, C2, C3, D1,	Student Projects	Project Supervision	Evaluation of Project Presentations and Reports
16	2	-	A1, B1, B2, C1, C3, D4	All Topics		Final Exam

Teaching Materials:

Textbook(s):	1. Whitman M. and Mattord H. (2014) *Principles of Information Security, 5th* Edition, Delmar Cengage Learning. 2. Stallings W. (2020) *Cryptography and Network Security: Principles and Practice*, 8th Edition, Pearson.
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Michael G. Gelles (2016), *Insider Threat: Prevention, Detection, Mitigation, and Deterrence,* Elsevier. 2. Tipton H. F. and Nozaki M. K. (2011), *Information Security Management Handbook*, 6th Edition, Auerbach Publications. 3. Schneier B. (2015) *Applied Cryptography: Protocols, Algorithms and Source Code in C*, 20th Anniversary Edition, John Wiley & Sons. 4. Darren Death (2017), *Information Security Handbook: Develop a threat model and incident response strategy to build a strong information security framework,* Packt. 5. Katz J. and Lindell Y. (2014) *Introduction to Modern Cryptography*, 2nd Edition, Chapman and Hall. 6. Rhodes-Ousley M. (2013) *Information Security the Complete Reference*, 2nd Edition, McGraw Hill Professional. 7. Smith R. E. (2015) *Elementary Information Security*, 2nd Edition, Jones & Bartlett Learning. 8. Gibson D. (2014) *Managing Risk in Information Systems (Information Systems Security & Assurance)*, 2nd Edition, Jones & Bartlett Learning.

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
Exercises	Exercises, whether in-class or in-lab, cover problem solving and analysis questions and assess the students' ability in the analysis and application of different risk control techniques.	B1, B2, B3, C1	Formative
Case Studies	Different security project cases are analyzed and studied.	B1, D4	Formative

Assignments	Two assignments to be given to Students. The assignments will assess students' skills in differentiating, and analyzing information security techniques in addition to literature review.	A2, B2, C1, D1, D3	20%
Major Test	The major test is a written, in-class 90 minutes test. It will cover topics studied in the first 10 weeks. The majority of the test's questions are problem solving, short answer, and analysis questions.	A1, B1, B2, C1, D4	20%
Project	Student will work as groups of 2-4 members to develop a security system as a project. This will go through several phases in which the student should analyze, and design a security system for a real world application.	A2, B1, B2, B3, C1, C2, C3, D1, D2, D3	20%
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It will consist of analysis, design, short-answer and essay questions.	A1, B1, B2, C1, C3, D4	40%
Overall			100%

Admissions	
Minimum number of students	**5**
Maximum number of students	**20**

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COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 409 - Operating systems

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

Prerequisite: ITCS 214

NQF Level Allocated: Level 8

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

Description: This course is to cover the concepts, structure, and functions of operating system (OS). Students will learn how an operating system provides an environment in which users can execute programs in a convenient and efficient manner. Topics covered include computer system and OS structure; process management: process, threads, CPU scheduling, process synchronization, deadlocks; memory management; mass storage management, and file systems.

Objective:

1. To critically understand the specialist theories, principles and concepts of modern operating systems.
2. To explain the fundamental structure of modern operating system and its core functions and services.
3. To critically examine and evaluate different strategies and techniques used by operating systems to manage computer recourses.
4. To examine the algorithmic ideas integrated in the design and implementation of different operating systems.

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 the concepts of operating system, its architecture and functions.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** Demonstrate critical knowledge and understanding of major current issues of computer recourses management and methods of handling these problems in modern operating systems.	Knowledge: theoretical understanding [Level 8]
A3	*Professional Responsibility: N/A*	*N/A*
B. Subject-specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving:** Use a range of approaches to critically analyze and evaluate practices of operating systems in identifying, defining and solving problems by using alternative effective and efficient algorithms.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT &Numeracy [Level 8]
B2	**Modeling and Design:** Use a range of specialist models to model the problems of computer and communication systems, such as deadlock, and design efficient and effective handling procedures.	Knowledge: Practical Application [Level 8]
B3	*Application of Methods and Tools: N/A*	*N/A*
C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic skills:** Critically analyze and evaluate the performance and effectiveness of different algorithms used by different operating systems.	Generic Problem Solving & Analytical skills [Level 8]
C2	*Synthetic: N/A*	*N/A*
C3	**Creative Thinking and innovation:** Extend knowledge in operating system to construct specific and effective solution to manage and control computer resources.	Generic Problem Solving & Analytical skills [Level 8]
D. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/**

		Level
D1	**Communication:** Show ability to communicate information in appropriate oral and written forms.	Communication, ICT and Numeracy Skills [Level 8]
D2	*Teamwork and Leadership: N/A*	*N/A*
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 8]
D4	*Ethics and Social Responsibility: N/A*	*N/A*

Course Structure (Outline)

Week	Hours Lec.	Hours Lab	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3	-	A1	Introduction	Lecture	Oral Participation
2	3	-	A1	Computer Hardware Structure Overview	Lecture/ Class Discussion	Oral Participation
3	3	-	A1	Operating System Concepts and Structure	Lecture/ Class Discussion	Quiz1
4	3	-	A1	**Process:** Concepts, States, Operations, Process Communication	Lecture/ Class Discussion	Oral Participation
5	3	-	A1	**Threads:** Benefits, Multi-core Systems	Lecture/ Class Discussion	Oral Participation
6	3	-	A1, B1, C1	**Memory Management**	Lecture/ In-Class Supervised Work	In-Class Exercises/ Assignment1
7	3	-	A1, B1	**Virtual Memory**	Lecture/ Class Discussion	Oral Participation
8-9	6	-	A2, B1, B2, C1, C3	**Process Management:** Process Synchronization and Scheduling	Lecture/ Independent Learning/ In-Class Supervised Work	In-Class Exercises/ Major Test (week 8)

10	3	-	A2, B1, B2, C1, C3, D1, D3	**Process Management:** Deadlocks	Lecture/ In-Class Supervised Work	In-Class Exercises/Quiz 2 (Week 10)/ Assignment2
11	3	-	A1, B1, B2, C1,	**Mass Storage Management**	Lecture/ In-Class Supervised Work / Independent Learning	In-Class Exercises/ Quiz 3
12	3	-	A1, B1, C1, D1, D3	**System administrations and File-Systems**	Lecture/ Class Discussion	Assignment3/ Quiz 4
13-14	6	-	B1, C1	**System administration: Linux**	In Lab Demonstration In-Lab Supervised Work	In-Lab Exercises
15	3	-	-	Revision	Class Discussion	
16	2	-	A1, A2, B1, B2, C1, C3	All Topics		Final Exam

Teaching Materials:

Textbook (s):	1. Silberschatz A., Galvin P. B. and Gagne G. (2018) *Operating System Concepts, 10*th Edition, Wiley..
Handout (s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Jain, Manish. (2018) Basic System Administration. Beginning Modern Unix. Apress, Berkeley, ISBN: 978-1484235270. 2. Tanenbaum, Andrew S. Modern operating system. 4th GLOBAL Edition, Pearson Education, Inc, 2014. ISBN: 9781292061429 3. Mchose A. and Flynn I. M. (2018) Understanding Operating Systems, 8th Edition, Cengage Learning. ISBN10: 1-305-67425-1 4. Richard Blum and Christine Bresnahan, Linux Command Line and Shell Scripting Bible, Wiley; 4th edition (2021), ISBN-13 : 978-1119700913.

Assessment

Type of Assessment	Description	ILOs	Weighting
Quizzes	Four written quizzes to be conducted where the average of best two quizzes will be considered.	A1	10 %
Assignments	Three Assignments to be given to students, each assignment worth 10%. The assignments will assess students' awareness of the current trends and advancements in operating systems. It will include verity of case studies and implementation of some operating system concepts and techniques.	A2, B1, B2, C1, C3, D1, D3	30 %
In-Class Exercises	In-class exercises consisting mainly of problem solving and analysis questions.	B1, B2, C1	Formative
Oral Participation	In-class participation and discussion will assess student understanding of several concepts and theories.	A1	Formative
Major Test	The major test is a written, in-class 90 minutes test. It will cover topics studied in the first eight weeks. The majority of the test's questions are problem solving and analysis questions.	A1, B1, B2, C1	20 %
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It will consist of problem solving, short-answer, analysis, and essay questions.	A1, A2, B1, B2, C1, C3	40%
Overall			**100%**

Admissions	
Minimum number of students	**5**
Maximum number of students	**25**

COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 413 - Intelligent Systems

Weight: **(2 - 2 - 3)**

Prerequisite: ITCS 303

NQF Level Allocated: Level 8

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

Description:

This course is to cover the specialist theory, concepts, and methods of intelligent systems. It enables students to solve complex problems using various Artificial Intelligence (AI) techniques, and to develop effective intelligent systems using range of AI tools. It covers the concepts of intelligent agent and problem formulation; search-based problem solving techniques, such as A*; knowledge-based problem solving techniques: knowledge representation, knowledge reasoning, and expert systems.

Objective:

1. To critically understand the specialist theories, principles, and concepts of AI.
2. To study and critically analyze various AI techniques and knowledge representation methods including semantic nets, frames, propositional calculus, predicate calculus, and production system.
3. To solve complex real world problems using AI methods.
4. To develop effective AI systems using specialized AI tools and techniques.

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 specialist theories, principles, concepts, and detailed knowledge of some of AI techniques and applications.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** N/A	N/A
A3	**Professional Responsibility:** N/A	N/A

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Identify and critically analyze problems, and solve these problems using range of specialized skills, and techniques of AI.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design:** Formulate problems and knowledge, and design components needed to implement intelligent systems to meet the desired needs within realistic constraints.	Knowledge: Practical Application [Level 8]
B3	**Application of Methods and Tools:** Apply specialized AI tools and techniques to implement intelligent system components.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Critically evaluate AI algorithms, methods, and techniques in terms of efficiency, optimality, and completeness.	Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic:** Integrate different AI components in order to develop effective and efficient intelligent system.	Generic Problem Solving & Analytical skills [Level 8]

C3	Creative Thinking and innovation:	N/A	N/A

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Demonstrate ability to communicate information in appropriate oral and written forms to a variety of audience.	Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a team in order to complete a pre-defined project.	Competence: Autonomy, Responsibility and Context [Level 8]
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignments.	Competence: Autonomy, Responsibility and Context [Level 8]
D4	Ethics and Social Responsibility:	N/A	N/A

Course Structure (Outline)

Course Structure (Outline)						
Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1	**Introduction And Intelligent Agents:** AI and Intelligent Agent Concepts	Lecture/ Class Discussion	
2	2	2	A1, B2, B3	**Problem Solving:** Problem Definition And Formulation, Problem Solving Agents.	Lecture/ In-Class Supervised Work/ Lab Demonstration	In-Class Exercises/ In-Lab-Exercises
3	2	2	A1, B2, B3	**Search-Based Problem Solving:** Search Space Graph and Tree	Lecture/ In-Class and In-Lab Supervised Work	In-Class Exercises/ In-Lab-Exercises
4	2	2	A1, B1, B3, C1	**Search-based Problem solving:** Simple And Uniformed Search Strategies	Lecture/ In-Class and In-Lab Supervised Work	In-Class Exercises/ In-Lab-Exercises

5-6	4	4	A1, B1, B2, B3, C1, D3	**Search-Based Problem Solving:** Best First Search: Greedy, A* Search, Hill Climbing Algorithms	Lecture/ In-Class and In-Lab Supervised Work / Independent Learning	Assignment 1/ Lab Project1 (Week6)
7	2	2	A1, B3	**Knowledge-Based Problem Solving:** Concepts, Components	Lecture/ Lab Demonstration	Oral Participation/ In-Lab-Exercises
8	2	2	A1, B2, B3	**Knowledge Representation:** Propositional Logic, First Order Logic	Lecture/ In-Class Supervised Work / Lab Demonstration	In-Class Exercises/ In-Lab-Exercises
9	2	2	A1, B2, B3	**Knowledge Representation:** Production Rules	Lecture/ Lab Demonstration	Oral Participation/ In-Lab-Exercises
10	2	2	A1, B2, B3, C1	**Knowledge Representation:** Semantic Network, Frames And Objects	Lecture/ In-Class and In-Lab Supervised Work	Major Test/ In-Lab Exercises
11	2	2	A1, B3	**Knowledge and Reasoning:** Inference Engine	Lecture/ In-Lab Supervised Work	In-Lab Exercises
12	2	2	A1, B1, B3, C1	**Knowledge and Reasoning:** Forward And Backward Chaining	Lecture/ In-Class and In-Lab Supervised Work/ Debate	In-Class Exercises/ In-Lab Exercises
13	2	2	A1, B1, B3, C2, D3	**Knowledge Based Systems:** Concepts And Development	Lecture/ In-Lab Supervised Work / Independent Learning	Assignment 2/ In-Lab Exercises
14	2	2	A1, B1, B3, D3	Expert Systems	Lecture/ In-Lab Supervised Work	Lab Project2

| 15 | 2 | 2 | B1, B2, B3, C1, C2, D1, D2, D3 | Student Projects | Project Supervision | Evaluation of Project Report and Presentation |
| 16 | 2 | - | A1, B1, B2, C1, C2 | **All Topics** | | Final Exam |

Teaching Materials:

Textbook(s):	1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 4th edition, 2020. ISBN-13 : 978-0134610993 2. Vinod Chandra S.S. and An and Hareendran S. (2014) Artificial Intelligence and Machine Learning, PHI Learning.
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Alberich-Bayarri, A., Pastor, A.J., González, R.L. and Castro, F.G., (2019). How to Develop Artificial Intelligence Applications. In Artificial Intelligence in Medical Imaging. Springer, Cham. 2. Slade, Stephen. (2019), Artificial Intelligence Applications on Wall Street. Routledge. 3. Negenvistsky M. (2011) Artificial Intelligence: A Guide to Intelligent Systems, 3rd Edition, Pearson. 4. Association for Advancement of Artificial Intelligence (AAAI) Website: http://www.aaai.org/home.html 5. Michael Wooldridge, A Brief History of Artificial Intelligence: What It Is, Where We Are, and Where We Are Going. Flatiron Books (January 19, 2021). ISBN-13 : 978-1250770745. 6. Roy Freedle, Artificial Intelligence and the Future of Testing 1st Edition BY . Psychology Press; 1 edition (September 8, 2016) ISBN: 9781138987562 7. Vinod Chandra S.S. and Anand Hareendran S. (2014) *Artificial Intelligence and Machine Learning, PHI Learning*, 1st Edition, ISBN: 9788120349346

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
Assignments	Students will be asked for two assignments, each worth 5%. 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 AI. The assignment will also assess students' skills to solve and analyze different AI techniques, methods and tools.	A1, B1, B2, C1, D3	10%

Lab Projects	Students will be asked to develop two small programs, one using a procedural language to implement a search algorithm, and the second is to use AI language, such as PROLOG, to develop small intelligent software. Each worth 5%.	B1, B2, B3, D3	10%
Major Test	The major Test will be an in-class 90 minutes exam that will consist of short-answer, essay, and problem solving questions and cover the topics studied in the first 9 weeks.	A1, B1, B2, C1	20%
Project	Starting from weak 4, the class will be divided into teams of 4-5 students and each will be asked to develop an intelligent system for solving hard problem using research-based or knowledge-based techniques. Students have to study the problem, plan and execute AI application. 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.	B1, B2, B3,C1,C2, D1, D2, D3	20%
Final Exam	The final exam is comprehensive and of two hours duration. It will consist of short-answer, essay and problem-solving questions in AI.	A1, B1, B2, C1, C2	40%
In-Lab Exercises	Each of the lab exercises consists of a set of practical tasks to be implemented by students individually in class as shown in the above weekly structure. Students work will be observed and directly during the lab sessions.	B3	Formative
In-Class Exercises	In-class exercises consist of problem solving and analysis questions.	B1, B2, C1	Formative
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures.	A1	Formative
Overall			100%

Admissions	
Minimum number of students	5
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 INFORMATION TECHNOLOGY

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

Course Code & Title: ITCS 422 - Distributed Systems

Weight: 2-2-3

Prerequisite: ITCS 409

NQF Level Allocated: 8

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

Description: The course focuses on the key aspects of distributed systems. It imparts knowledge of distributed systems principles, design, and implementation. It covers transparency in a distributed system, architectures, processes, virtualization, RPC, message passing, communication, quality of service, and naming.

Objective:

1. To critically understand the concepts, specialist theories, and techniques behind the design of distributed systems.
2. To analyze the clustering and cluster computing.
3. To apply simulation tools in distributed systems problems solving.
4. To develop advanced skills for selecting appropriate solutions to meet the user requirements.

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical understanding of concepts, and specialized theories relating to distributed systems.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** Recognize up-to-date trends, applications, tools available, and methods in distributed systems.	Knowledge: theoretical understanding [Level 8]
A3	**Professional Responsibility:** N/A	
B. Subject-specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving:** Identify real life problems and solve them by designing efficient and effective distributed systems.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design:** Design distributed systems by choosing appropriate components and models that satisfy user specifications.	Knowledge: Practical Application [Level 8]
B3	**Application of Methods and Tools:** Apply simulation software tools to solve the problems of distributed computing.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic skills:** Critically analyze a problem and user specification to choose the appropriate distributed system architecture to solve this problem.	Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic:** Integrate the components of distributed systems into incorporated system.	Generic Problem Solving & Analytical skills [Level 8]
C3	**Creative Thinking and innovation:** Demonstrate creativity in designing distributed systems for new applications.	Generic Problem Solving & Analytical skills [Level 8]
D. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:** Show ability to communicate information in appropriate oral and written forms.	Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:** Show ability to work effectively as a member/leader of a development 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]
D4	**Ethics and Social Responsibility:** N/A			

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>2</td><td>2</td><td>A1</td><td>**Introduction**:

Introduction to Distributed System</td><td>Lecture/ Lab Demonstration</td><td></td></tr>
<tr><td>2</td><td>2</td><td>2</td><td>A1</td><td>**Definitions, Goals, and Examples**:

Definitions and Goals of Distributed System, Real Examples of Distributed Systems</td><td>Lecture/ Class Discussion/Lab Demonstration</td><td>Oral Participation</td></tr>
<tr><td>3</td><td>2</td><td>2</td><td>A1, B2, B3</td><td>**Challenges in Distributed System Design:**

Lack of global knowledge, Scalability, Communication Cost, Transparency, Security, Mobility</td><td>Lecture/ lab Demonstration</td><td>Oral Participation/ In-Lab Exercises</td></tr>
<tr><td>4</td><td>2</td><td>2</td><td>A1, B1, B3, C1</td><td>**Architectures:**

Architectures-I Layered Architectures

Architectures-II Object-Based Architectures</td><td>Lecture/ In-Class and In-Lab Supervised Work</td><td>In-Lab Exercises

Quiz1</td></tr>
<tr><td>5</td><td>2</td><td>2</td><td>A1, B1, B3,</td><td>**Architectures:**</td><td>Lecture/ In-Class and In-</td><td>In-Lab Exercises</td></tr>
</table>

			C1	Architectures-III Data-Centered Architectures Architectures-VI Event-based Architectures	Lab Supervised Work	
6	2	2	A1, B1, C1	**Network as a graph:** Spanning Tree and MST, Traversal of graphs, Broadcasting messages, Communication complexity	Lecture/ In-Class and In-Lab Supervised Work	In-Lab Exercises
7	2	2	A1, A2, B1, B2, B3, C1, C2, C3, D3	**P2P:** P2P Algorithms	Lecture/ In-Lab Supervised Work/ Independent Learning	Assignment/ In-Lab Exercises
8	2	2	A1, B1, B2, B3, C1, C2	**Process and Thread**: Process Thread, Thread Implementation	Lecture/ In-Lab Supervised Work	In-Lab Exercises Quiz2
9	2	2	A1, B1, C1	**Time synchronization:** Time synchronization in Distributed System	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Major Test
10	2	2	A1, B1, B3, C1, C2	**Virtualization**	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Oral Participation
11	2	2	A1, B1	**Communication and Modeling**: Communication Fundamentals	Lecture/ In-Lab Supervised Work	In-Lab Exercises
12	2	2	A1, B1, B3, C1, C2	**Communication and Modeling**: Communication	Lecture/ In-Class and In-Lab	Oral Participation/ In-Lab Exercises

				between Nodes, RPC	Supervised Work	Quiz3
13-14	4	4	A1, C1, C2, B1, B2	**Distributed Database:** Distributed transaction management, Distributed concurrency control, Distributed deadlock handling, Maintaining consistency	Lecture/ In-Lab Supervised Work	In-Lab Exercises
15	2	2	A2, B1, B2, C1, C2, C3, D1, D2, D3	Student Project	Project Supervision	Evaluation of Project Presentations and Reports
16			A1, B1, B2, C1, C2	All Topics		Final Exam

Teaching Materials:

Textbook(s):	1. Tanenbaum A. and Steen M. V. (2017) *Distributed Systems And networks*, 3rd Edition, Prentice Hall.
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Tanenbaum A. and Steen M. V. (2013) *Distributed Systems Principles and Paradigms*, 2nd Revised Edition, Pearson Education Limited. 2. M. Tamer Özsu, Patrick Valduriez (2020) *Principles of Distributed Database Systems* 4th ed. 2020 Edition. 3. Gerardus Blokdyk(2020) Distributed File System A Complete Guide 2020 Edition 4. Kartikeya Mishra(2020) Guide to Big data Hadoop Distributed File System:A book for beginners/intermediate

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures and lab sessions.	A1	Formative
Quizzes	Three written quizzes to be conducted where the average of best two quizzes will be considered.	A1, B1	10%
Assignment	The assignment consists of essay, problem-solving and research based theoretical questions regarding topics in distributed system. The purpose of the assignment is to assess students where they have to demonstrate their extensive and detailed knowledge and critical understanding of key concepts of distributed system.	A1, A2, B1, B2, C1, C2, C3, D3	10%
Major Test	The test will be an in-class 90 minutes exam that will consist of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks.	A1, B1, B2, C1	20%
In-Lab Exercises	Each of the practical exercises consists of a set of practical tasks to be implemented by students individually in lab as shown in the above weekly structure. Each of the exercises assesses the students' skills in the application of distributed systems. Students work will be observed and evaluated directly during the lab sessions.	B1, B2, B3	5%
Project	Starting from weak 4, the class will be divided into teams of 2-3 students where each team will be asked to develop a small distributed system application.	A2, B1, B2, C1, C2, C3, D1, D2, D3	15%
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, B1,B2, C1, C2	40%
Overall:			**100 %**

Admissions	
Minimum number of students	**5**
Maximum number of students	**20**

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COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

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

Course Code & Title:	**ITCS 425 – Web Engineering**
Weight:	**(2-2-3)**
Prerequisite:	**ITMS 205 & ITCS 327**
NQF Level Allocated:	**8**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

Description: Modern web applications are complex systems; therefore, a systematic approach is required for developing web-based information systems. This course is to study the concepts, methods, and techniques needed for developing web-based applications. Topics covered: concepts and architecture of web-based information systems, web system development phases, web technologies and the desired quality characteristics of web applications.

Objective:

1. To critically understand concepts, standards, and specialist theories of web applications.
2. To understand the architecture of Web-based information systems.
3. To understand the development phases of web-based information systems.
4. To critically analyze the quality metrics of web-based information systems.
5. To implement web-based information systems using various specialized web tool and technologies.

Semester:

Instructor (s):

Office Telephone: EXT: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical understanding of principles, standards, and concepts related to World Wide Web and web-based applications.	Knowledge: theoretical understanding [Level8]
A2	**Contemporary Trends, Problems and Research:** Demonstrate critical understanding of current issues of web applications as well as research on new trends and web technologies needed to handle these issues.	Knowledge: theoretical understanding [Level8]
A3	**Professional Responsibility: N/A**	

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Critically analyze and identify real world problems and choose the appropriate web design to solve these problems.	Knowledge: Practical Application [Level8] Skills: Communication, ICT & Numeracy [Level8]
B2	**Modeling and Design:** Model different aspects of web applications such as: data, presentation, and hypertext, as well as design a web application that meets web standards by designing front end web page and connecting it to the back end databases.	Knowledge: Practical Application [Level8]
B3	**Application of Methods and Tools:** Use specialized web technologies to implement various web applications such as: Web Markup languages, Web GUI technologies, PHP, and XML.	Knowledge: Practical Application [Level8] Skills: Communication, ICT & Numeracy [Level8]

	C. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Critically assess, compare and select emerging and existing web technologies, as well as analyze the quality metrics of web applications to meet the web standards and user needs.	Generic Problem Solving& Analytical skills [Level8]
C2	**Synthetic:** Integrate websites with other IT applications as well as implement web interface for underlying databases.	Generic Problem Solving& Analytical skills [Level8]
C3	**Creative:** Demonstrate creativity in the application of web technologies as well as in the development of effective and efficient web applications to solve real world problems.	Generic Problem Solving& Analytical skills [Level8]

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor/ Level
D1	**Communication:** Express and communicate critical ideas, such as, system specification, system analysis, in written and oral forms.	Communicatio n, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:** Demonstrate the ability to work as a group member/leader and share the ideas of each other.	Competence: Autonomy, Responsibility and Context [Level8]
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignments and project.	Competence: Autonomy, Responsibility and Context [Level8]
D4	**Ethical and Social Responsibility: N/A**	

Course Structure (Outline)

Week	Hours		ILOs	Unit/Moduleor TopicTitle	Teaching Method	Assessment Method
	Lecture	Lab				
1	2	2	A1	**Introduction to Internet & World Wide Web:** −History of the Internet & World- Wide Web −Web Browsers −Web Servers −Uniform Resource Locator − Tools and Web Programming Languages.	Lecture	
2	2	2	A1,B3, D1,D3	**Introduction and overview:** −Definitions −Web Standards −Categories of Web Applications − Characteristics of Web Applications. **Hypertext Mark Up Language (HTML) Revision:** −Basic HTML page −Text Formatting −Table −Headers −Linking − Images −List −Meta Elements	Lecture/ Debate/Lab Demonstration	Assignment1/ In-Lab Exercise

3	2	2	A1,B1, B3	**−Web-Based Information System Architecture:** −Fundamentals −Components of a Generic Web Application Architecture −Categorizing Architectures based on integrated components. −Layered Architectures **Cascading Style Sheets(CSS) Revision:** − Inline, Internal and External Style Sheet − Conflicting Styles − Positioning Elements Backgrounds, Element Dimensions, Text Flow and the Box Model −User Style Sheet	Lecture/ Debate/Lab Demonstration	In-Lab Exercise
4-5	4	4	A1,B1, B3	**Requirements Collection:** −Where Do Requirements Come From? Requirements Engineering Activities − RE Specifics in Web Engineering − Principles for RE of Web Applications − Adapting RE Methods to Web Application Development. **Writing Basic PHP Programs:** −Creating PHP Programs −Numbers and Strings −Literals and Variables −Operators and Functions	Lecture/Class Discussion/In-Lab Supervised Work	In-Lab Exercise

6-7	4	4	B1,B2, B3,D1, D3	**Modeling:** −Fundamentals −Modeling Requirements −Content Modeling −Hypertext Modeling −Presentation Modeling **Forms & PHP:** −Creating Form Controls − Using Values Returned From Forms Using PHP	Lecture/In-Class Supervised Work/In-Lab Supervised Work	Assignment2/ In-Lab Exercise
8-9	4	4	A2,B1, B2,B3, D1,D3	**Web Applications Design.** **Web Applications Design and Relational Database:** −Relational Database Model − SQL (SELECT, WHERE, ORDER BY, INNER JOIN, INSERT, UPDATE and DELETE statements)	Lecture/ Independent Learning/In-Lab Supervised Work	In-Lab Exercise/ Assignmen t3 (Literature Review, week9)
10-12	6	6	A1,B1, B3,C1, C2	**The Quality Characteristics of Web Applications:** Usability, Performance and Security. **PHP Database Connectivity (Integration of application to data layer):** −Connecting to Database Server −Selecting Databases −Checking for Errors − Closing the MySQL Server Connection	Lecture/In-Class Supervised Work/Lab Demonstration/ In-Lab Supervised Work	Major Test (week10)/In - Lab Exercise
13	2	2	B1,B3	**Manipulating Data in MySQL Using PHP** − Inserting, Viewing, Updating and Deleting Records −Manipulating joined tables **User Authentication** −Creating Session −Authorization Level	In-Lab Supervised Work	In-Lab Exercise

14	2	2	A1,B1, B2,B3	**Security in Web** - Synchronous and Asynchronous Communication among web services - Same session protocol - Same Origin Protocol - Improving security **Extensible Markup Language (XML)** −Introduction −Structuring Data −Document Type Definition −XML Vocabularies − Document Object Model (DOM) with JavaScript −Extensible Style sheet Language Transforms (XSLT)	Lecture/Lab Demonstration/ In-Lab Supervised Work	Lab Test
15	2	2	A2,B1, B2,B3, C1,C2, C3,D1, D2,D3	**Student Project**	Project Supervision	Evaluation of Project Presentations and Reports
16	2	-	A1, A2,B1, B2,C1	All Topics		Final Exam

* Formative assessment

Teaching Materials:

Textbook(s):	1. Rajiv Chopra. (2016) *Web Engineering,* 1st Edition, PHI Learning Pvt Ltd, ISBN: 978-8120352544 2. Robin Nixon (2018) *Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5*, 5th Edition, O'Reilly Media, ISBN: 978-1491978917
Handout(s):	PowerPointslidesavailableonMoodlei.e.http://www.ahlia.edu.bh/moodle
Reference(s):	1. Robert W. Sebesta, (2015), Programming the World Wide Web -8TH ED., University of Colorado at Colorado Springs,Boston, Pearson, ISBN: 9780133775983 2. Ullman L (2016) *PHP for the Web: Visual Quick Start Guide*, Fifth Edition, Peach pit Press. 3. Pressman R. and Lowe D. (2008) *Web Engineering: a practitioner's*

approach, First Edition, McGraw Hill
4. www.w3schools.com
5. www.php.net
6. Any development frameworks shared on moodle.

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
In-Lab Exercises	Exercises cover problem solving questions and help the student in differentiating the importance of each web technology.	B1,B3, C2	Formative
Lab Test	A practical test of two hours to assess students' skills in developing web applications.	B1,B3, C2	20%
Assignments	Three assignments to be given to students, each assignment worth 5 marks and their average will be considered at the end. The assignments will assess students' skills in differentiating, analyzing, and modeling web applications in addition to literature review.	A1,A2, B1,B2, D1,D3	5%
Major Test	The major test is a written, in-class 90 minutes test. It will cover topics studied in the first 10 weeks. The majority of the test's questions are problem solving, short answer, and analysis questions.	A1,B1, B2,C1	20%
Project	Student will work as groups of 2-4 members to develop a web application as project. This will go through several phases in which the student should design, implement, and test a web application of his/her choice.	A2,B1, B2,B3, C1,C2, C3,D1, D2,D3	15%
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It will consist of analysis, design and modeling, short-answer and essay questions.	A1,A2, B1,B2, C1	40%
Overall:			**100 %**

Admissions	
Minimum number of students	5
Maximum number of students	20

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Course Code & Title:	**ITCS 427 – Mobile Computing**
Weight:	**(2-2-3)**
Prerequisite:	**ITCS 221 & ECTE 329**
NQF Level Allocated:	**8**
NQF Notional Hours / Credits:	**120 notional hours/ 12 NQF credit**

Description: This course is to cover the concepts and technologies of mobile computing such as 2G/3G/4G networks, and mobile applications development. It imparts knowledge of mobile communication architectures and related communication protocols in addition to location management and messaging. The course also covers the mobile applications development tools and techniques needed to create efficient and effective mobile applications.

Objective:

1. To critically understand the concepts, specialist theories, and technologies of mobile computing.
2. To cover both theoretical and practical issues of mobile computing.
3. To develop advanced skills for developing mobile computing applications utilizing specialized mobile programming tools.

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of the mobile computing technologies and applications.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** Recognize the current computing issues and research on emerging mobile computing technologies.	Knowledge: theoretical understanding [Level 8]
A3	**Professional Responsibility:** NA	

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Critically identify and analyze mobile computing and real world problems and choose/develop appropriate techniques and applications to solve these problems.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design:** Design mobile applications, including programs, data, and user interface that meet user requirements.	Knowledge: Practical Application [Level 8]
B3	**Application of Methods and Tools:** Apply advanced specialized mobile programming tools to develop mobile applications.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Critically analyze the performance of the developed mobile applications.	Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic:** Integrate components of an application such as Database into one complete mobile application.	Generic Problem Solving & Analytical skills

		[Level 8]
C3	**Creative Thinking and innovation:** Demonstrate ability to propose solutions for problems related to mobile computing through investigation of different protocols, tools, and technologies.	Generic Problem Solving & Analytical skills [Level 8]

D. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:** Show ability to communicate clearly to convey complex information and ideas in appropriate oral and written forms.	Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:** Work effectively as a member/leader of a team who may plan, design, and implement a mobile application.	Competence: Autonomy, Responsibility and Context [Level 8]
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignments.	Competence: Autonomy, Responsibility and Context [Level 8]
D4	**Ethics and Social Responsibility:** NA	

Course Structure (Outline)

Course Structure (Outline)						
Week	**Hours**		**ILOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
	Lec.	**Lab**				
1	2	2	A1,B3	**Mobile Computing-** **An Overview:** • Motivations, Concepts, Challenges, and Applications Of Mobile Computing. • Introduction to mobile development, and SPA • Overview of iOS and Android operating system. • Types of mobile apps (Native, Web, Hybrid) **Lab:** • Introduction to JavaScript	Lecture/ Lab Demonstration	

				programming.		
2	2	2	A1	**Distributed Systems**	Lecture	Oral Participation
3	2	2	A1	**Pervasive Computing**	Lecture	Oral Participation
4	2	2	A1	**Mobile communications:** • Wireless Transmission, • Cell Design And Area Planning For Cellular Networks. Frequency Reuses And Channel Designs.	Lecture	Oral Participation
5	2	2	A1	**Cellular Network And Architectures:** • GSM And Other 2G, 3G and 4G Networks.	Lecture	Oral Participation
6	2	2	A1, B1, B2, B3	**Introduction to Visual Studio Code, Git, NodeJS**	Lecture/ In-Lab Supervised Work	Oral Participation
7	2	2	A1	**Hybrid App Mobile Development**	Lecture	Oral Participation
8	2	2	A1, B3	**Version Control Systems: Git**	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Oral Participation
9	2	2	A1, B3	**NodeJS**	Lecture/ In-Lab Supervised Work	In-Lab Exercises/
10	2	2	A1, B1, B2, B3, C1	**IONIC** **Lab:** • Create first hybrid mobile app • Running Ionic app using android Studio	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Oral Participation / Major Test
11	2	2	A1, A2, B1, B2, B3,	**Know the different templates of IONIC** **Lab:** • Build 3 different hybrid mobile	Lecture/ In-Lab Supervised Work/ Independent Learning	In-Lab Exercises/ Oral Participation /

			D1, D3	app using the different ionic templates		Assignment 1
12	2	2	A1, B1, B2, B3, C1, C2, C3	**Ionic Creator** **Lab:** • Creating a project using Ionic Creator • Importing a project into ionic	Lecture/ In-Lab Supervised Work	Lab Project1
13	2	2	A1, B1, B2, B3, C1, C2, C3	**Ionic Lists and Ionic Inputs** **Lab:** • Creating a project using the different types of Ionic Lists and Ionic Inputs	Lecture/ In-Lab Supervised Work	Lab Project2
14	2	2	A1, A2, B1, B2, B3, D1, D3	**Ionic Tabs and Ionic Form Validation** **Lab:** • Creating a project using the different types of Ionic Tabs and Ionic Form Validation	Lecture/ In-Lab Supervised Work/ Independent Learning	In-Lab Exercises/ Assignment 2 (Literature Review)
15	2	2	A2, B1, B2, B3, C1, C2, C3, D1, D2, D3	Student Projects	Project Supervision	Evaluation of Project Presentations and Reports
16	2	-	A1, A2, B1, B2, C1	All Topics		Final Exam

* Formative assessment

Teaching Materials:

Textbook(s):	1- Rahat Khanna, Sani Yusuf, Hoc Phan (2017). Ionic: Hybrid Mobile App Development, Packt Publishing. ISBN: 978-1788293112. 2- Victor Savkin, Jeff Cross (2017). *Essential Angular 4*, Packt Publishing. ISBN: 978-1788293761
Handout(s):	A v a i l a b l e o n http://www.ahlia.edu.bh/moodle.
Reference(s):	1- Cory Beard, William Stallings (2015). *Wireless Communications Networks and Systems* Global Edition, Pearson Higher Ed. ISBN: 9781292108711 2- Herve Franceschi (2018). *Android App Development*, Jones & Bartlett Learning. ISBN: 978-1284092127 3- Trish Cornez, Richard Cornez (2015). *Android Programming Concepts,* Jones & Bartlett Learning. ISBN: 978-1284070705. 4- Kyle Mew (2017). *Android Design Patterns and Best Practices*, Packt Publishing. ISBN: 978-1786467218. 5- Clifton I. G. (2015) *Android User Interface Design: Implementing Material Design for developers*, 2nd Edition Addison-Wesley Professional. ISBN: 978-0134191409 **Websites** Google, Android Developer Resources: https://developer.android.com/index.html AngularJS by Google https://angularjs.org/ Ionic Framework Doc http://ionicframework.com/

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures and lab sessions.	A1	Formative
In-Lab Exercises	Each of the lab exercises consists of a set of practical tasks to be implemented by students individually in class as shown in the above weekly structure. Students work will be observed and directly during the lab sessions.	B3	Formative
Assignments	Two assignments for Literature review. Average will be taken.	A2, D1, D3	15%
Lab Projects	Students will be asked to use and apply appropriate development tools to develop and manipulate specific mobile applications. Students has to code, test and deploy interactive mobile	B1, B2, B3, C1, C2, C3	10%

	applications with more emphasizes on the use of creative efficient modern User Interfaces, communication, telephony, graphics and multimedia components.		
Major Test	The test will be an in-class 90 minutes exam that will consist of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks.	A1, B1, B2, C1	20%
Project	Each group of 2-4 students has to develop a mobile application for solving a real world problem. Each group has to go though all phases of system development cycle, and submit a report and present the work in the class.	A2, B1, B2, B3, C1, C2, C3, D1, D2, D3	15%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, analysis, essay, and problem-solving questions.	A1, A2, B1, B2, C1	40%
Overall:			**100 %**

Admissions	
Minimum number of students	**5**
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 Information Technology
<u>**COURSE SYLLABUS/ SPECIFICATION**</u>

Course Code & Title:	**ITCS 435 - Database Administration II**
Weight:	**(2-2-3)**
Prerequisite:	**ITCS 336**
NQF Level Allocated:	**Level 8**

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

Description: This course provides students with critical knowledge and advanced training on diagnostic resources, globalization support, managing resources, flashback databases and recovering from user errors. It also provides details on maintaining and management of memory as well as automating tasks with the scheduler.

Objective:

1. To diagnose and repair data failures with Flashback technology.
2. To manage space and optimize database storage in response to growing space requirements.
3. To monitor and manage major database components, including memory, performance and resources.
4. To secure the availability of Oracle database through appropriate backup and recovery strategies.
5. To automate DBA tasks with the scheduler.

Semester:

Instructor:

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of concepts and principles of the most important responsibilities a DBA has, like: performing backup and recovery as well as automating tasks via the scheduler.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:**	N/A
A3	**Professional Responsibility:**	N/A

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Use *Specialist Skills* to manage and optimize database storage, diagnose and repair data failure, perform backup and data recovery as well scheduler to automate different tasks.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design:**	N/A
B3	**Application of Methods and Tools:** Apply *specialized tools* while monitoring, diagnosing and securing database; such as Recovery Manager (RMAN) command-line and enterprise manager, Data Recovery Advisor (DRA) and Automatic Diagnostic Repository (ODR).	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** *Critically evaluate* the various tools of configuring, managing, monitoring, diagnosing and securing a database and choose the appropriate tools for a given situation.	Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic:**	N/A
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:** Use specialist skills to express and communicate critical ideas related to data base administration in oral and written form.	Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:**	N/A
D3	**Organizational and Developmental Skills:** Demonstrate responsibility ~~ability~~ to organize ideas and effectively allocate time in a given assignment.	Competence: Autonomy, Responsibility and Context [Level 8]
D4	**Ethics and Social Responsibility:**	N/A

Course Structure (Outline)

Week	Hours Lec.	Hours Lab	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4	-	A1	Introduction and syllabus distribution.	Lecture	
2	2	2	A1, B1, B3	• Core Concepts and Tools of the Oracle Database • Configuring for Recoverability	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
3	2	2	A1, B1, B3	• Using the RMAN Recovery Catalog • Configuring Backup Settings	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Quiz1
4	2	2	A1, B1, B3, C1	• Creating Backups with RMAN • Restore and Recovery Task	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
5	2	2	A1, B1, B3, C1, D1, D3	• Using RMAN to Perform Recovery • Monitoring and Tuning RMAN	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Assignment 1
6	2	2	A1, B1, B3, C1	Diagnosing the Database	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
7	2	2	A1, B1, B3	Using Flashback Technology I	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
8	2	2	A1, B1, B3	Using Flashback Technology II	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
9	2	2	B1, B3, C1	Performing Flashback Database	Lecture/ Class Discussion/ In-Lab Supervised Work	Lab Test
10	2	2	A1, B1, B3, C1	• Managing Memory • Managing Database Performance	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises

11	2	2	A1, B1, B3, C1	• Managing Performance by SQL Tuning • Managing Resources Automating Tasks with the Scheduler	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Quiz 2
12	2	2	A1, B1, B3, C1	• Managing Space in Blocks • Managing Space in Segments • Managing Space for the database	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
13	2	2	A1, B1, B3, C1, D1, D3	• Duplicating a Database	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Assignment 2
14-15	4	4	A1, B1, B3, C1	• Data Ingestion • Data Ingestion Framework • Structured and Unstructured Data • Data Ingestion as a service	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises
16	2	-	A1, B1,C1	All Topics		Final Exam

Teaching Materials:

Textbook(s):	1- Bob Bryla (2015), *Oracle Database 12c DBA Handbook (Oracle Press),* McGraw-Hill Education, ISBN: 978-0071798785. 2- Bob Bryla & Kevin Loney (2014), *Oracle Database 12c The Complete Reference (Oracle Press),* McGraw-Hill Education, ISBN: 978-0071801751.
Handout(s):	Oracle Learning Library available through: http://www.oracle.com/technetwork/tutorials/index.html

	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Gehani N. and Annamalai M. (2013) *The Database Book – Principles and Practice using the Oracle Database System,* Universities Press. 2. Biju Thomas, OCA: Oracle Database 12c Administrator Certified Associate Study Guide: Exams 1Z0-061 and 1Z0-062 1st Edition, Sybex; 1 edition (May 12, 2014). ISBN: 978-1118643952 3. Website: http://www.oracle.com

Assessments:

Type of Assessment	Description	ILOs	Weighting
Assignments	The students will be given 2 research based assignments each worth 10 marks and their total will be considered at the end.	A1, B1, C1, D1, D3	20%
Quizzes	The purpose of the quiz is to assess the students' knowledge and understanding of the topics covered in the course like managing and optimizing database storage, diagnosing and repairing data failure, Performing backup and recovery as well as automating tasks via the scheduler. Students will be given two quizzes, each one is 30 minutes, and the best one will be	A1, B1, C1	10%
Lab Test	The knowledge and practical skills of students will be evaluated throughout practical test that will be of 90 minutes. It will cover topics discussed in the first 9 weeks.	B1, B3, C1	30%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of multiple choice questions, fill in the blank, short-answer and few essay questions.	A1, B1, C1	40%
In-Lab Exercises	Each of the In-Lab exercises consists of a set of practical tasks to be carried by the students during lab time and that will help in evaluating hands-on capability of the students	B1, B3, C1	Formative
Overall			**100%**

Admissions	
Minimum number of students	5
Maximum number of students	20

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COLLEGE OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

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

Course Code & Title:	**ITCS 441 - System Administration II**
Weight:	**(2-2-3)**
Prerequisite:	**ITCS 341**
NQF Level Allocated:	**Level 8**

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

Description: This course provides critical knowledge and experience for IT professionals. Student will have the knowledge required to assemble components based on customer requirements, install, configure and maintain devices, PCs and software for end users, understand the basics of networking and security/forensics, properly and safely diagnose, resolve and document common hardware and software issues while applying troubleshooting skills. Student will also provide appropriate customer support; understand the basics of virtualization, desktop imaging, and deployment.

Objective:

1. To explain commercial operating Systems functionality and components.
2. To configure commercial operating systems to suite personnel & corporate uses.
3. To explain troubleshooting techniques and executing them.
4. To explain the differences between mobile devices and standard PC architecture and functionality.

Semester:

Instructor:

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical understanding of various Microsoft operating systems, its command line tools, some of its networking and security utilities as well as different Mobile devices and troubleshooting techniques.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research: N/A**	
A3	**Professional Responsibility: N/A**	
B. Subject-specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving:** Detect various system symptoms and choose the appropriate tool for troubleshooting it.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design: N/A**	
B3	**Application of Methods and Tools:** Perform preventive maintenance procedures using appropriate tools as well as use different command line tools to customize and configure the operating system.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic skills:** Analyze specific scenario to choose appropriate security methods and tools	Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic: N/A**	
C3	**Creative: N/A**	
D. General and Transferable Skills (other skills relevant to employability and personal development)		**NQF Descriptor/ Level**
D1	**Communication:** Communicate efficiently and fluently.	Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership: N/A**	
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 8]
D4	**Ethical and Social Responsibility: N/A**	

Course Structure (Outline)

| Week | Hours | | ILOs | Unit/Module or Topic Title | Teaching Method | Assessment Method |
	Lecture	Lab				
1	2	2	A1	**Syllabus, Introduction**	Lecture	
2	2	2	A1, B3	**Operating Systems** 1. The Windows OS 2. Windows XP 3. Windows Vista 4. Windows 7 5. 32 or 64 bit 6. Upgrading Windows 7. Windows Upgrade Advisor 8. Upgrade Paths	Lecture/ In-Lab Supervised Work	In-Lab Exercises
3	2	2	A1, B3, C1	**Installing Windows** 1. Hardware Requirements 2. Boot Methods 3. Hard Disk Partitioning 4. Partition Schemes and Types 5. File System Formatting- part I 6. File System Formatting- part II 7. Workgroup Vs. Domain 8. Factory Recovery Partitions	Lecture/ In-Lab Supervised Work	In-Lab Exercises
4-5	4	4	A1, B3	**Windows command Line Tools** 1. OS Commands 2. TASKKILL 3. BootRec 4. Shutdown 5. Working with	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Quiz1

6	2	2	A1, B3	**Networking Command Line Tools** 1. PING 2. IPCONFIG 3. TRACERT 4. NETSTAT 5. NET 6. NSLOOKUP	Lecture/ In-Lab Supervised Work	In-Lab Exercises
7-8	4	4	A1, B3, C1, D1, D3	**Administrative Tools** 1. Computer Management 2. Device Manager 3. Local Security Policy 4. Performance Monitor 5. Services 6. Windows Memory Diagnostic 7. Windows Firewall 8. WFAS 9. MSCONFIG 10. Task Manager 11. Disk Management	Lecture/ In-Lab Supervised Work	In-Lab Exercises/ Assignment 1
9	2	2	A1, B3	**Control Panel Utilities** 1. Internet Options 2. Display 3. Folder Options 4. User Accounts 5. System 6. Power Options	Lecture/ In-Lab Supervised Work	In-Lab Exercises

10	2	2	A1, B3	**Configuring Windows Networking** 1. Windows 7 Homegroups 2. Network Shares 3. Mapping Drives 4. Network Types 5. Alternative IP Addresses	Lecture/ In-Lab Supervised Work	Major Test
11	2	2	A1, B3, C1	**Sharing Resources** 1. NTFS Vs. Share Permissions. 2. Allow Vs. Deny 3. Moving Vs. Copying.	Lecture/ In-Lab Supervised Work	In-Lab Exercises
12	2	2	A1, B3, C1	**Security** 1. Physical Security. 2. Digital Security. 3. User Education 4. Common Security Threats 5. Malware - Part I 6. Malware - Part II 7. Hard Drive Disposal 8. Securing A Wireless Network	Lecture/ In-Lab Supervised Work	In-Lab Exercises
13	2	2	A1, B3, C1	**Mobile** 1. Android Vs. iOS. 2. Mobile Features. 3. Bluetooth 4. Laptops Vs. Tablet PCs	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercises/ Quiz2

14-15	4	4	A1, B1, B3, C1, D1, D3	**Troubleshooting** 1. Common Hard Drive Symptoms. 2. Hard Drive Troubleshooting Tools. 3. Common Display Symptoms 4. Troubleshooting Network Issues 5. Network Troubleshooting Tools 6. Common OS Symptoms 7. OS Troubleshooting Tools 8. Common Printer Symptoms	Lecture/ Class Discussion/ In-Lab Supervised Work/ Independent Learning/ Demonstration	In-Lab Exercises/ Assignment 2
16	2	-	A1, B1, C1	All Topics		Final Exam

* Formative assessment

Teaching Materials:

Textbook(s):	1- Faithe Wempen, Jane Holcombe, (2019) *CompTIA A+ Certification Study Guide*, 10th Edition (Exams 220-1001 & 220-1002), McGraw-Hill Education, ISBN: 978-1260456653
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	COMPTIA A+ CERTIFICATION Website https://certification.comptia.org/getCertified/certifications/a.aspx

Assessments:

Type of Assessment	Description	ILOs	Weighting
In-Lab Exercises	Each of the In-Lab exercises consists of a set of practical tasks to be carried by the students during lab time and that will help in evaluating hands-on capability of the students.	B1, B3, C1	Formative
Quizzes	The purpose of the quiz is to assess the students' knowledge and understanding of the topics covered in the course like various Windows OS, its command line tools, different mobile devices, etc.. Students will be given two quizzes, each one is 30 minutes, and the best one will be considered.	A1, C1	10%
Major Test	The test will be an in-class 60 minutes exam that will consist of multiple choice questions, fill in the blank, short-answer and few essay questions. It will cover the topics studied in the first 10 weeks.	A1, C1	30%
Assignments	The students will be given 2 research based assignments each worth 15 marks and their average will be considered at the end.	A1, B1, C1, D1, D3	20%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of multiple choice questions, fill in the blank, short-answer and few essay questions.	A1, B1, C1	40%
Overall			**100%**

Admissions	
Minimum number of students	5
Maximum number of students	20

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

Course Code & Title: ITCS 442 - Virtualization

Weight: (2 - 2 - 3)

Prerequisite: ITCS 335

NQF Level Allocated: 8

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

Description: This course is designed primarily for IT professionals who have some experience with NOS. It is designed for professionals who will be responsible for managing storage servers and computing elements by using NOS, and who need to understand the scenarios, requirements, and storage and compute options that are available and applicable to NOS.

Objectives:

1. Prepare and install Nano Server, a Server Core installation, and plan a server upgrade and migration strategy.
2. Describe the various storage options, including partition table formats, basic and dynamic disks, file systems, virtual hard disks, and drive hardware, and explain how to manage disks and volumes.
3. Describe enterprise storage solutions, and select the appropriate solution for a given situation.
4. Implement and manage Storage Spaces and Data Deduplication.
5. Install and configure host virtualization, and configure virtual machines and host virtualization containers.
6. Describe the high availability and disaster recovery technologies in NOS.
7. Plan, create, and manage a failover cluster and implement failover clustering for Hyper-V virtual machines.
8. Configure a Network Load Balancing (NLB) cluster, and plan for an NLB implementation.
9. Create and manage deployment images.
10. Manage, monitor, and maintain virtual machine installations.

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of various virtualization requirements, storage and compute technologies for local and enterprise.	Knowledge: Theoretical Understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:**	N/A
A3	**Professional Responsibility:**	N/A
B. Subject-specific Skills		**NQF Descriptor/ Level**
B1	**Problem Solving:** Demonstrate ability to use specialist skills to prepare, install and configure nano server, server core, host virtualization, containers and virtual machines.	Knowledge: Practical Application[Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design:** Demonstrate creativity in Designing a well thought out plans for configuring storage technology and implementing disaster recovery.	Knowledge: Practical Application [Level 8]
B3	**Application of Methods and Tools:** Apply specialized tools while installing, managing and configuring nano and core servers, host virtualization, containers and virtual machines.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
C. Critical-Thinking Skills		**NQF Descriptor/ Level**
C1	**Analytic skills:** *Critically evaluate* the various tools of configuring and managing servers, failover clusters, virtual hosts and machines as well as choose the appropriate tools for a given situation.	Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic:**	N/A

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:** Use Specialist skills to express and communicate critical ideas related to virtualization and storage technologies in oral and written form.	Communication, ICT & Numeracy Skills [Level 8]
D2	Teamwork and Leadership:	N/A
D3	**Organizational and Developmental Skills:** Demonstrate ability to organize ideas and effectively allocate time in a given assignment.	Competence: Autonomy, Responsibility and Context [Level 8]
D4	Ethics and Social Responsibility:	N/A

Course Structure (Outline)

Week	Hours Lec.	Hours Lab	ILOs	Topics	Teaching Method	Assessment Method
1	2	2	A1	Introduction and Syllabus Distribution	Lecture	
2	2	2	A1, B3	Installing, upgrading, and migrating servers and workloads	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise
3	2	2	A1, B3	Configuring local storage	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise
4	2	2	A1, B2, B3, C1	Implementing enterprise storage solutions	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise/ Quiz1
5	2	2	B3, C1, D1, D3	Implementing Storage Spaces and Data Deduplication	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise/ Assignment 1
6	2	2	B3	Installing and configuring Hyper-V and virtual machines	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise
7	2	2	B3	Deploying and managing Windows and Hyper-V containers	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise
8	2	2	A1, B2, B3, C1	Overview of high availability and disaster recovery	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise
9-10	4	4	A1, B3, C1	Implementing failover clustering	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise / Major Test
11	2	2	A1, B3, C1	Implementing failover clustering with Windows Server 2016 Hyper-V	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise / Quiz2
12	2	2	A1, B3, C1	Implementing Network Load Balancing	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise
13	2	2	A1, B3	Creating and managing deployment images	Lecture/ Class Discussion/ In-Lab Supervised Work	In-Lab Exercise
14-15	4	4	A1, B3, C1	Managing,	Lecture/ Class	In-Lab Exercise/

			D1, D3	monitoring, and maintaining virtual machine installations	Discussion/ In-Lab Supervised Work	Assignment2
16	2	-	A1, B1, C1	All Topic		Final Exam

Teaching Materials:

Textbook(s):	Craig Zacker (2017), *Exam Ref 70-740 Installation, Storage and Compute with Windows Server 2016*, Microsoft Press, ISBN: 978-0735698826
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	Microsoft Course 20740C Website https://www.microsoft.com/en-ca/learning/course.aspx?cid=20740

Assessments:

Method of Assessment	Description	Learning Outcomes	Weighting
Assignments	Students will be given two assignments each worth 10 marks and their total will be considered at the end.	B1, B2, B3, C1, D1, D3	20%
Quizzes	The purpose of the quiz is to assess the students' knowledge and understanding of the topics covered in the course like managing and configuring nano and core server, virtual host and machines. Students will be given two quizzes, each one is 30 minutes, and the best one will be considered.	A1, C1	10%
Major Test	The test will be an in-class 60 minutes exam that will consist of multiple choice questions, fill in the blank, short-answer and few essay questions. It will cover the topics studied in the first 9 weeks.	A1, C1	30%
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of multiple choice questions, fill in the blank, short-answer and few essay questions.	A1, B1, C1	40%
In-Lab Exercises	Each of the In-Lab exercises consists of a set of practical tasks to be carried by the students during lab time and that will help in evaluating hands-on capability of the students.	B1, B3, C1	Formative
		Overall:	**100 %**

Admissions	
Minimum number of students	5
Maximum number of students	20

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Course Code & Title:	ITCS 443 – Security Services
Weight:	(2-2 -3)
Prerequisite:	ITCS 404
NQF Level Allocated:	Level 8
NQF Notional Hours / Credits:	120 notional hours/ 12 NQF credit

Description: This course provides layers of protection that helps to address both known and emerging threats. Students will learn how to secure the system and its infrastructure. Moreover, they can critically analyze how protections were built to mitigate an array of attack vectors and to deal with overall threat of ongoing attacks inside the datacenter both at hardware and software levels. Explore ways to configure network security, including firewalls, and look at secure virtualization, like encryption-supported virtual machines. Further, students will establish specialized skills in security service concepts such as data and network forensics, malware analysis, threat detection, privileged identity, desired state configuration and more.

Objective:

1. To critically understand the core theories, standards, security metrics, threat landscape, vulnerabilities, system hardening and concepts of information security.
2. To design specialist solutions for system hardening, threat detection, privileged identity and mitigation of threats.
3. To critically understand and analyze the supporting security external infrastructure.
4. To work on specialist security implementation using security features of Hyper-V, Desired State Configuration (DSC) and Encrypting File System (EFS).
5. To critically evaluate the nature of attacks using malware analysis techniques along with the relevant security forensics to provide specialized security solutions.
6. To research modern trends of information security, such as cloud security as well as software security assurance.

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of core concepts, and specialist theories related to security services and underlying infrastructure.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** Demonstrate critical understanding of major current issues of security services, and research in new cybersecurity trends.	Knowledge: theoretical understanding [Level 8]
A3	**Professional Responsibility: N/A**	

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Critically analyze and identify the existing security problems in order to reduce and overcome the systems vulnerabilities.	Knowledge: Practical Application [Level 8]
B2	**Modeling and Design**: Design effective security services to meet user requirements and aid in threat detection and mitigation.	Knowledge: Practical Application [Level 8]
B3	**Application of Methods and Tools:** Apply specialized security tools and metrics to implement relevant security services, malware analysis and forensics.	Knowledge: Practical Application [Level 8]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Critically assess, compare and select the proper malware analysis technique along with the relevant security forensics in evaluating the nature of attacks.	Generic Problem solving & Analytical skills [Level 8]
C2	**Synthetic:** Demonstrate insight to integrate appropriate information security components into one effective security system.	Generic Problem solving & Analytical skills [Level 8]
C3	**Creative Thinking and innovation:** Demonstrate creativity in the development of effective security systems to control the problems of information systems.	Generic Problem solving & Analytical skills [Level 8]

	D. General and Transferable Skills (other skills relevant to employability and personal development)	NQF Descriptor / Level
D1	**Communication:** Demonstrate specialist skills to express and communicate complex ideas related to security services in written and oral forms.	Communication, ICT and Numeracy skills [Level 8]
D2	**Teamwork and Leadership:** Demonstrate the ability and responsibility to work as a group member/leader and share the ideas together	Competence: Autonomy, Responsibility and context [Level 8]
D3	**Organizational and Developmental Skills:** Demonstrate the specialist level skills to organize ideas and effectively allocate time in given assignments and project.	Competence: Autonomy, Responsibility and context [Level 8]
D4	**Ethics and Social Responsibility:** Demonstrate the specialist level skills in applying ethics in information security.	Competence: Autonomy, Responsibility and context [Level 8]

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	4	-	A1	**Introduction** CIA principle Attacks types, Vulnerabilities IDS, Common Security Measures	Lecture / Class Discussion	
2	2	2	A1, A2, B1, B3	**Vulnerabilities and system hardening** System Hardening significance Analyzing Vulnerabilities Configure disk and file encryption Implementing malware protection	Lecture/ Class Discussion	In-Lab Exercises
3	2	2	A1, B1, B3	**System Hardening Solutions**	Lecture/ Lab Demonstra-	In-Lab Exercises

					tion / In-Class Supervised work/ Case studies	
				Protect credentials Create security baselines		
4	2	2	A1, A2, B1,B2, B3, C1	**Securing Cloud and Virtualization Infrastructure** Cloud Security Model SaaS as Virtualization Infrastructure Design Guarded Fabric solution Synthesize the shielded and encryption-supported VMs	Lecture/ Lab Demonstra-tion / In-Lab Supervised Work/ Case studies	In-Lab Exercises
5	2	2	A1,A2, B2,B3,C1,C2 ,D1, D3	**Securing Datacenter and underlying Network Infrastructure** Configure Windows Firewall Implement a Software Defined Datacenter Firewall Secure network traffic	Lecture/ Lab Demonstra-tion/ Case Studies	In-Lab Exercises / Assignment 1 (Week 5)
6	2	2	A1, B1, B2, B3	**Manage Privileged Identities** Design and Implement Just-In-Time (JIT) Administration Local Administrator Password Solution (LAPS)	Lecture / In-Class Supervised work / Lab Demonstra-tion	In-Lab Exercises
7	2	2	A1, B1,B2, B3, C1, C2	**Manage Privileged Identities** Implement Just-Enough-Administration (JEA) Analyze the implementation of Privileged Access Workstations (PAWs) and User Rights Assignments	Lecture/ In-Class Supervised work / In-Lab Supervised Work/ Case studies	In-Lab Exercises

8	2	2	A1, A2,B1, B2, B3, C1	**Malware Analysis** Malware Categorization Static Malware Analysis Static properties analysis of malware Dynamic Malware Analysis Interactive behavior analysis of malware Manual Code Reversing	Lecture/ In-Class Supervised work / Lab Demonstration/ Case studies	In-Lab Exercises
9	2	2	A1, A2,B1, B2, B3, C1, D1, D3	**Data Forensics** Digital evidence controls: Uncovering data acquisition, disk imaging, recovering swap files, temporary & cache files, memory forensic and various attacks by GUI tools	Lecture/ In-Class Supervised work / Lab Demonstration / Case studies	In-Lab Exercises / Assignment 2
10	2	2	A1, A2,B1, B2, B3, C1, D4	**Network Forensics** Collecting and analyzing network-based evidence Reconstructing web browsing, e-mail activity, and registry changes, intrusion detection and tracking offenders	Lecture/ Case studies / Lab Demonstration	In-Lab Exercises / Major Test (Week 10)
11	2	2	A1, B3,C1,C2	**Threat Detection Solutions** Configure advanced audit policies Install and configure Microsoft Advanced Threat Analytics (ATA)	Lecture/In-Lab Supervised Work/ Case Studies	In-Lab Exercises
12	2	2	A1, B3,C1,C2	**Threat Detection Solutions** Determine threat detection solutions using Operations Management Suite (OMS)	Lecture/ In Class Supervised work / In Lab supervised work	In-Lab Exercises

13	2	2	A1, A2, B1, B3, C1, D4	**Security Standards and Controls** Security Standards Security Metrics and Key Performance Indicators (KPIs) Challenge of security metrics Metrics and FISMA Security Ethics	Lecture/ Lab Demonstra- tion/ Case studies/ Class Discussion	In-Lab Exercises
14	2	2	A1, A2, B1, B2, B3,C1,C2,	**Software Assurance** Secure application design and development Securing server workload Secure file services infrastructure Dynamic Access Control (DAC)	Lecture/ Lab Demonstra- tion / Class Discussion/In Lab supervised work/ Case Studies	In-Lab Exercises
15	2	2	A2, B1,B2,B3, C1,C2,C3,D1 , D2,D3,D4	Student Projects	Project Supervision	Evaluation of Project Presentations and Reports
16			A1,B1,B2, C1,C3,D4	All topics		Final Exam

Teaching Materials:

Textbook(s):	1. Warner, Timothy L., and Craig Zacker. (2017), Securing Windows Server 2016. Microsoft Press, 978-1509304264 2. Yuri Diogenes, Erdal Ozkaya. (2019), Cybersecurity – Attack and Defense Strategies: Counter modern threats and employ state-of-the-art tools and techniques to protect your organization against cybercriminals, 2nd Edition Kindle Edition, Packt Publishing, ISBN: 978-1-83882-779-3
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	1. Palmer, Michael. (2017), Hands-On Microsoft Windows Server, Cengage Learnin, 978-1305078628. 2. Liu, Dale, and RemcoWisselink. (2016), Securing Windows Server. 3. Monnappa K A (2018), Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware 1st Edition, Kindle Edition, Packt Publishing, ISBN: 978-1-78839-250-1

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
Major Test	The major test is a written 90 minutes test. It will cover topics studied in the first 10 weeks. The majority of the test's questions are problem solving, short answer, and analysis questions.	A1, B1, B2, C1, D4	20%
Assignments	Two research based assignments to be given each worth 10%. The assignments will assess students' skills in differentiating, and critically analyzing the implementation of security services.	A2, B2, C1, D1, D3	20%
Project	Student will work as groups of 2-4 members to develop a security system as a project. This will go through several phases in which the student should analyze, and design a security system for a real world application.	A2, B1, B2, B3, C1, C2, C3, D1, D2, D3, D4	20%
Final Exam	The final exam is a comprehensive, written exam and will be of two hours. It will consist of analysis, design, short-answer and essay questions.	A1, B1, B2, C1, C3, D4	40%
In-Lab Exercises	Exercises will help the students in understanding all the course topics and establishing relevant specialist skills.	B1,B3,C1, C2, B2	Formative
Case Studies	Different security project cases are analyzed and studied.	B1, C1, D4	Formative
Overall			**100%**

Admissions	
Minimum number of students	**5**
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 INFORMATION TECHNOLOGY

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 444 - Cloud Services Implementation

Weight: (2-2 -3)

Prerequisite: ITCS 442

NQF Level Allocated: Level 8

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

Description: This course teaches IT students how to provide and manage services in cloud environment. Students will learn critical knowledge about how to implement infrastructure components such as virtual networks, virtual machines, containers, web apps, and storage in cloud. Students will also establish the specialist ability to plan, configure and manage private, public and hybrid cloud infrastructures along with the integration of on-premises Active Directory domains. Moreover, dealing critically with non trivial issues in the cloud such as load balancing, caching, distributed transactions, and identity and authorization management is also meant to be learned. The course also provides the students with insight of intelligent and highly scalable services.

Objective:

1. To understand critical knowledge about Cloud architecture components, infrastructure, virtual clouds, containers, databases and storages, tools, and portals.
2. To plan, design, create, configure, manage and monitor specialist cloud services/components such as virtual machines, storage, backups, containers, dynamic load balancing and scalability to optimize availability and reliability.
3. To integrate in-house active directory to the cloud services.
4. To apply critical knowledge about cloud security models for the privacy of information as core assets.
5. To critically evaluate the best cloud contract negotiation that can guarantee the optimal and cost effective solution in the given scenarios with the assurance of ROI.
6. To implement cloud services that deals with high performance computation and large scalability.

Semester:

Instructor (s):

Office Telephone: **Email (s):**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:** Demonstrate critical knowledge and understanding of specialist theories, principles, and concepts of some of cloud services, cloud security, performance optimization and its implementations.	Knowledge: theoretical understanding [Level 8]
A2	**Contemporary Trends, Problems and Research:** N/A	
A3	**Professional Responsibility:** N/A	

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Analyze and identify the complex real world problems in order to provide solutions using cloud services.	Knowledge: Practical Application [Level 8]
B2	**Modeling and Design:** Use specialised skills to design components needed to implement cloud services to meet the desired needs within realistic constraints.	Knowledge: Practical Application [Level 8]
B3	**Application of Methods and Tools:** Apply specialized tools for planning and implementing cloud frameworks.	Knowledge: Practical Application [Level8]

	C. Critical-Thinking Skills	NQF Descriptor/ Level
C1	**Analytic skills:** Critically evaluate various approaches and techniques to provide effective cloud services to meet user needs.	Generic Problem Solving & Analytical skills [Level8]
C2	**Synthetic:** Use range of specialized cloud computing approaches to design cloud frameworks for real problems.	Generic Problem Solving & Analytical skills [Level8]
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:** Demonstrate the use of special skills to communicate technical information in appropriate oral and written forms to a variety of audiences.	Communication, ICT and Numeracy Skills [Level8]
D2	**Teamwork and Leadership:** Demonstrate specialist level skill set to work effectively as a member of a development team.	Competence: Autonomy, Responsibility and Context [Level8]
D3	**Organizational and Developmental Skills:** Demonstrate the specialist level skills to organize ideas and effectively allocate time in given assignments and project.	Competence: Autonomy, Responsibility and Context [Level8]
D4	**Ethics and Social Responsibility:** N/A	

Course Structure (Outline)

Week	Hours		ILOs	Topics	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1 B2, D1	Topic 1: Concepts and Fundamentals - Introduction to Cloud Architectures and Services - Cloud computing model - IaaS, SaaS, PaaS - General Benefits and Challenges - Main Players in the Field Lab: Awareness of cloud Environment	Lecture/ Class Discussion In-Class Supervised Work/ Lab Demonstration	In- Lab Exercises
2	2	2	A1, B1, B2, B3, C1	Topic 2: Cloud computing services - Classification and categorization of Key Cloud Services - Elastic instances, Storage, Queue, networking, communication, security and privacy, performance analyzer Lab: Using a deployment templates and wizard to implement basic cloud infrastructure	Lecture/ In-Class Supervised Work	In-Class Exercises/ In- Lab Exercises
3	2	2	A1,B1, B2, B3, C1	Topic 3: Virtual cloud and underlying network - Public Cloud - Private Cloud - Virtual Private Cloud - Real world application of virtual clouds Lab: Configuring basic cloud type and underlying network	Lecture/ In-Class Supervised Work/ Case study /Lab Demonstration	In-Class Exercises/ In- Lab Exercises

4	2	2	A1,B1, B2, B3, C1	Topic 4: Cloud Instances - Types of Cloud Instances - Significance of each instance in real world cloud Infrastructure Lab A: Creating and Configuring instances	Lecture/ In-Class Supervised Work / Independent Learning/ Lab Demonstration	In-Class Exercises/ In- Lab Exercises
5	2	2	A1, B1, B2, B3, C1	Topic 5: Working with Virtual Machines in Cloud - Implementation and management of Virtual Machines - Resource virtualization and management Lab B: Deploying virtual machine using wizard	Lecture/ In-Class Supervised Work/ In- Lab Supervised Work/ Debate	In-Class Exercises/ In- Lab Exercises
6	2	2	A1, B1, B2, B3, C1, C2	Topic 6: Working with Web Server in Cloud - Web server instance and web app implementation on cloud Lab: Implementing and hosting real world web app on Cloud web server	Lecture/ In-Class Supervised Work/ Case study / In-Lab Supervised Work / Independent Learning	In-Class Exercises In- Lab Exercises/ Assignment (Week6)
7	2	2	A1, B1, B2, B3, C1, C2	Topic 7: Planning and implementing file system and data storage Lab: Creating and managing relational and non relational Data storages	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	Oral Participation/ In-Class Exercises /In- Lab Exercises
8	2	2	A1, B1, B3 C1	Topic 8: Containers and Load balancing - Types of Containers - Implementing and managing containers - Load balancing Lab: Implementing containers on Virtual Machines	Lecture/ In-Class Supervised Work / In-Lab Supervised Work	Oral Participation / In-Class Exercises/ In- Lab Exercises

9	2	2	A1, B1, B2, B3, C1, C2,	Topic 9: Establishing cloud communication services - Communication within cloud - Simple Queuing and Simple notification services - Communication across clouds - Active directory management Lab: Pooling, sharing and Peering various cloud instances/services/ resources	Lecture/ In-Class Supervised Work/ Case studies /Lab Demonstration	In-Class Exercises/ In-Lab Exercises

10	2	2	A1,B1, B2, B3, C1, C2	Topic 10: Security and privacy in Cloud
				- Overview of Security Issues
				- Security reference model
				- Implementation and management of security and privacy services within cloud
				  ○ IAM
				  ○ backup, and recovery services
				Lab: Implementing security services on existing cloud for data privacy assurance
					Lecture/ In-Class Supervised Work/ Case studies / Debate	In-Class Exercises/ In-Lab Exercises

11	2	2	A1, B1, B2, B3, C1, C2, A1	Topic 11: Capacity planning and contracts in Cloud - Contract types for various cloud services - Cost plans for Cloud services - Scalability w.r.t. Cost optimization and ROI Lab: Planning and Selecting optimal services for cost effective infrastructure	Lecture/ In-Class Exercises / In-Class Supervised Work/ Case studies /Lab Demonstration	Major Test/ In-Lab Exercises

12	2	2	A1, B1, B2, B3, C1, C2,	Topic 12: Scaling in the Cloud - Working with Elastic Load Balancing - Caching - Auto Scaling for optimal cloud utilization Lab: Implementing and managing load balancing and auto scaling	Lecture/ In-Class Supervised Work/ Case Study/ In-Lab Supervised Work / Independent Learning	Oral Participation / In-Class Exercises /In- Lab Exercises
13	2	2	A1, B1, B2, B3, C1, C2, D3	Topic 13: Performing Large Distributed computation using cloud services Lab: Automation of cloud that is largely Scaled environment and underlying management	Lecture/ In-Class Supervised Work /In-Lab Supervised Work	In-Class Exercises/ In-Lab Exercises /Lab Project (Week13)
14	2	2	A1, B1, B2, B3, C1,C2	Topic 14: High performance computations and intelligent computation services Lab: Automation of cloud based handling of big data and applying intelligent algorithms	Lecture/ In-Class Supervised Work/Lab Demonstration	In-Class Exercises/ In-Lab Exercises
15	2	2	B1, B2, B3, C1, C2, D1, D2, D3	Student Projects	Project Supervision	Evaluation of Project Report and Presentation
16	2	2	A1,B1, B2,C1,C2	All Topics		Final Exam

Teaching Materials:

Textbook(s):	1. Bhowmik, Sandeep. (2017), *Cloud Computing*. Cambridge University Press. 2. Washam, Michael, Rick Rainey, Dan Patrick, and Steve Ross. (2018), *Implementing Microsoft Azure Infrastructure Solutions*. Microsoft Press.
Handout(s):	Available on Moodle i.e.http://www.ahlia.edu.bh/moodle
Reference(s):	1. Rittinghouse, John W., and James F. Ransome. (2016), *Cloud computing: implementation, management, and security*. CRC press. 2. Raja, C. Venish, K. Chitra, and M. Jonafark. (2018), A Survey on Mobile Cloud Computing. 3. Anthony J. Sequeira (2019), AWS Certified Cloud Practitioner (CLF-C01) Cert Guide (Certification Guide) 1st Edition, Kindle Edition, Pearson IT Certification, ISBN: 978-0789760487

Assessment

Method of Assessment	Description	Learning Outcomes	Weighting
In-Lab Exercises	Each practical exercise consists of a set of practical tasks to be implemented by students individually in lab as shown in the above weekly structure. Each of the exercises assesses the student's skills in the field of cloud services implementation. Students work will be observed and evaluated directly during the lab sessions	B3	Formative
In-Class Exercises	In-class exercises consist of problem solving and analysis questions.	B1,B2,C1	Formative
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures and lab sessions.	A1	Formative
Assignment	Students will be given one assignment. The purpose of the assignment is to assess students critical understanding of key concepts, theories, methods, tools and techniques of cloud services. The assignment will also assess students' specialist skills to critically analyze different Cloud techniques and services by providing relevant solutions.	A1,B1, B2,C1,D3	10%
Lab Project	Students will be given a task and related requirements to implement and administer the functionality of Cloud tools.	B1,B2,B3, D3	10%
Major Test	The test will be an in-class 90 minute exam that will consists of short-answer, essay, and problem-solving questions that cover the topics studied in the first 10 weeks	A1,B1, B2,C1	20%
Project	Starting from weak 4, the students will be formed as a group of 3-4 students and each group will be asked to select a system for which they need to implement cloud services. In the final week, each group will have to submit their written report explaining the problem statement, methods used, analysis, implementation and the conclusion highlighting the findings and results. It must explain precisely the work accomplished by each student. Each group will be required to make a presentation summarizing the work conducted and its findings. Each group member has to participate in the presentation. Group-based work will be examined and evaluated as a whole as well as the individual work of each student. Group members will be	B1,B2, B3,C1,C2, D1,D2,D3	20%

	tested individually during the presentation by peers and the instructor.		
Final Exam	The final exam is comprehensive one that will be of two hours duration. It will consist of short-answer, essay and problem-solving questions.	A1,B1, B2,C1,C2	40%
Overall:			**100 %**

Admissions	
Minimum number of students	**5**
Maximum number of students	**20**

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COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
<u>**COURSE SYLLABUS/ SPECIFICATION**</u>

Course Code & Title: **ITCS 499 – Major Project**

Weight: **(0-6-3)**

Prerequisite: **IERM 498 & ETHC 392**

NQF Level Allocated: **Level 8**

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

Description: Each student is required to select a theoretical and/or a practical problem related to his major area, and work under the supervision of a faculty member. All stages of project development should be emphasized including problem identification, library search, planning, design and/or construction of equipment upon completion of the project, the student must submit a final written report outlining the various phases of the project and make an oral presentation.

Objective:

1. To conduct an independent research project on certain chosen topic in the field of IT that involves formulating a real-world problem, developing its requirements, developing, designing and testing software based solution, and finally writing a report highlight the results of the project.
2. To employ the knowledge of software engineering in the project development of a software solution to a real-world problem.
3. To demonstrate independence, research ethics, academic integrity and originality, critical thinking and problem-solving, practical and written skills, as well as organization and time-management skills.

Semester:

Instructor:

Office Telephone: **Email:**

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	**Concepts and Theories:**	N/A
A2	**Contemporary Trends, Problems and Research:** Demonstrate an informed and critical awareness of research issues and methods, technological advancements, and current solutions related to some problems in the field of Information Technology.	Knowledge: theoretical understanding [Level 8]
A3	**Professional Responsibility:** Demonstrate cognition of and adhere to professional code of conduct as an IT practitioner and researcher.	Knowledge: theoretical understanding [Level 8]

B. Subject-specific Skills		NQF Descriptor/ Level
B1	**Problem Solving:** Solve IT problems; plan, design, and implement their computable solutions.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	**Modeling and Design:** Design and develop models for computational systems, components, or processes to meet desired needs within realistic constraints.	Knowledge: Practical Application [Level 8]
B3	**Application of Methods and Tools:** Use effective research methods to gather data and demonstrate proficient use of programming languages and software as required for the research being undertaken.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]

C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	**Analytic skills:** Analyze problems; identify the appropriate computational resources (input) needed to solve them and analyze the effectiveness and efficiency of output accordingly generated.	Generic Problem Solving & Analytical skills [Level 8]
C2	**Synthetic:** Develop computerized solution to real life problem and document it in a well-structured project.	Generic Problem Solving & Analytical skills [Level 8]
C3	**Creative:** Create new or improve existing ideas, concepts, techniques, methods, tools, and theories in the field of IT	Generic Problem Solving & Analytical skills [Level 8]

D. General and Transferable Skills (other skills relevant to employability and personal development)		NQF Descriptor/ Level
D1	**Communication:** Communicate ideas cogently, persuasively and effectively, in written and oral form, to a diverse range of audiences and stakeholders.	Communication, ICT and Numeracy Skills [Level 8]
D2	**Teamwork and Leadership:**	N/A
D3	**Organizational and Developmental Skills:** Engage in life-long learning and continuing self-development to hone professional and organizational and time management skills to write a project within certain timeline.	Competence: Autonomy, Responsibility and Context [Level 8]
D4	**Ethics and Social Responsibility:** Follow research ethics and social responsibility and respond positively to the needs of society by employing	Competence: Autonomy, Responsibility and Context

effectively the advanced computing and information solutions and technologies.	[Level 8]

Course Structure (Outline):

The course consists of the following components that may span up to two semesters.

1. Writing and submitting project proposal that identify a problem in the field of IT and highlight the research methods and tools to be used.

2. Conducting scientific research and writing project in consultation with the supervisor through regular meetings using Ahlia University's Undergraduate Project Guidelines XXXX 499. The timeline and the key milestones are typically as follows:

Key Milestones	Timeline
Introduction and Problem Definition ↓ Propose and study an important research topic/problem ↓ Define research problem, history, motivation, and objectives ↓ Write a draft introduction chapter and seek advice from supervisor ↓ Revise the chapter accordingly	2 weeks
Literature Review ↓ Search and gather literature on the research topic/problem ↓ Study research methods and solutions developed for such research problem ↓ Write a draft chapter on Literature Review and discuss with supervisor ↓ Revise the chapter accordingly	3 weeks
Approach, Conceptual Model, Research Method and Tools ↓ Select and study conceptual model and effective research methods to be used Choose and study any other requirements, e.g., programming languages, software and other tools. ↓ Write a draft chapter on Conceptual Model, Research Methods and Tools ↓ Consult with supervisor and revise accordingly	3 weeks
Software Development, Experiments, Data Gathering and Analysis ↓ Solicit any software requirements and specifications if needed ↓ Design, implement and evaluate any software or experiments ↓ Gather and record any required data ↓ Record, study, analyze and interpret findings and raw data ↓ Discuss with supervisor results and conclusions and revise accordingly	4 weeks

Drafting Main Chapters in Project
 	
   ╋ Describe the development and implementation process of your software and experiments, if any
   ╋ Summarized your raw findings and data using, e.g., tables and charts
   ╋ Discuss scientifically and critically your findings, implications and conclusions
   ╋ Document any limitations and possible future work
   ╋ Discuss the final chapters with supervise, revise and finalize the dissertation accordingly
	3 weeks

Teaching Materials:

Textbook(s):	N/A
Handout(s):	Undergraduate Project Guidelines, Ahlia University.
Reference(s):	Students are free to choose the references that support their research studies in consultation with their supervisors.

Assessments:

The student research work, written project, oral presentation/defense, and other supplemented documentations or software is evaluated by an examination Committee as mentioned above according to University regulations described in the Project Presentation Guidelines XXXX 499, V. 2, Ahlia University. The student has to defend his/her project in front of the examination committee which consists of three examiners consisting of the supervisor, and two internal examiners. The student work will be evaluated as follows:

	Criteria	Marks	Total
Written Project	Problem Definition	14	**70%**
	Literature Search	14	
	Methodology & Analysis	14	
	Format	14	
	Documentation	14	
Oral Presentation	Organization, Eye Contact,& Delivery	10	**30%**
	Time Management & Presentation Skills	10	
	Questions & Answers	10	
Total		**100**	**100%**