Course Specification of Information Security

Course No (...................)

2020/2021

Head of Department	Vise Dean for Quality Assurance	Dean of the Faculty	Dean of Academic Development center and Quality
Dr. Ahmed Al-shalabi	Dr. Anwar Al-Shamiri	Dr. Nagi Al-Shibani	Assoc. Prof. Dr.Huda Al.Emad
			Rector of Sana'a University
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I. Course Identification and General Information:

1	**Course Title:**	Information Security				
2	**Course Code & Number:**					
3	**Credit hours:**	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2		2		2
4	**Study level/ semester at which this course is offered:**	3rd Level -1st Semester				
5	**Pre –requisite (if any):**	Computer Programming, Operating Systems and Network Fundamentals				
6	**Co –requisite (if any):**	None				
7	**Program (s) in which the course is offered:**	Computer Science, Information Systems and Information Technology				
8	**Language of teaching the course:**	Arabic/English				
9	**Study System**	Term based system				
10	**Mode of delivery:**	Full Time				
11	**Location of teaching the course:**	Faculty of computer science and technology.				
12	**Prepared By:**	Dr. Abdul Wasea Al-Azzani				
13	**Date of Approval**					

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II.   Course Description:

This course aims to student's acquiring a skills of maintain an information security properties through storing, processing and transmission. The course introduces the security properties, risks, vulnerabilities, threats and attacks and attacker types, authentication, access control, cryptography, software lifecycle, operating system security, networks and practical for develop, implement and manage a secure system to protect and defend information security resources.

III.		Course Intended learning outcomes (CILOs)	Referenced PILOs A2,A4, B4,B5, C1,C4, D1,D2,D5
	a.1	Explain the important of information security, security properties, risk, threats, vulnerabilities and attacks, access controls, authentication and security policies.	A2, A4
	a.2	Describe a cryptography, lifecycle of a product and security considerations in system development, operating system roles, web and network security.	A2, A4
	b.1	Explore and differentiate between threats, attacks, programs and programming oversights, security tools and techniques.	B5
	b.2	Analyze the impacts of threats, vulnerabilities and attacks on information security, and tradeoffs of balancing key security properties through a system development.	B4,
	c.1	Employ a security product lifecycle in system development and make a security considerations in each stage to build a secure system according to needs.	C1
	c.2	Solve a security problems and mange a security system to controls the access to computing security resources.	C4

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d.1	Work efficiently as a team member or individual according to ethical, legal, organization security policy, and responsibilities to perform a desired tasks.	D1,D5
d.2	Write a technical report related to information security topics.	D2

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	**Teaching strategies**	**Assessment Strategies**
a1- Explain the important of information security security properties, risk, threats, vulnerabilities and attacks, access controls, authentication and security policies.	Lecture, Exercises, Guided Individual Reading, Problem-Solving.	Written Examinations, Homework, Quizzes, Problem-Solving Exercises.
a2- Describe a cryptography, lifecycle of a product and security considerations in system development, operating system roles, web and network security.	Lecture, Exercises, Guided Individual Reading, Problem-Solving.	Written Examinations, Homework, Quizzes, Problem-Solving Exercises.

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	**Teaching strategies**	**Assessment Strategies**
b1- Explore and differentiate between threats, attacks, programs and programming oversights, security tools and techniques.	Lecture, Exercises, Lab sessions, Problem-Solving, Brainstorming, Project.	Written Examinations, Problem-Solving Exercises, Quizzes, Individual and Group Project.

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	Teaching strategies	Assessment Strategies
b2- Analyze the impacts of threats, vulnerabilities and attacks on information security, and tradeoffs of balancing key security properties through a system development.	Lecture, Exercises, Lab sessions, Problem-Solving, Brainstorming, Project.	Written Examinations, Problem-Solving Exercises, Quizzes, Individual and Group Project.

(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Employ a security product lifecycle in system development and make a security considerations in each stage to build a secure system according to needs.	Lectures, Individual/group project, Problem-Solving.	Presentation Project, Technical Report, Problem-Solving Exercise.
c2- Solve a security problems and mange a security system to controls the access to computing security resources.	Lectures, Individual/group project, Problem-Solving.	Presentation Project, Technical Report, Problem-Solving Exercise.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Work efficiently as a team member or individual according to ethical, legal, organization security policy, and responsibilities to perform a desired tasks.	Lab Sessions, Practical Report, Project.	Written Examinations (Lab), Technical Report, Individual and Group Project Presentation.

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d2- Write a technical report related to information security topics.	Lab Sessions, Practical Report, Project.	Written Examinations (Lab), Technical Report, Individual and Group Project Presentation.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Introduction	a1, b2	Meaning of Security, Information Security Definition and Areas, Information Security Classification, Information Security Properties/Goals (Confidentiality, Integrity, Availability), Acts on Security Properties (Interception, Interruption, Modification, Fabrication) Information Security vulnerability, threats and attacks, Computer Crimes, Information Assurance model, Countermeasures/Controls.	1	2

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2	Authentication	a1, b1, c2, d2	Identification Versus Authentication, Authentication Based on Phrase and Facts, Authentication Based on Biometric, Authentication Based on Token, Federated Identity Management, Multi Factors Authentication, Secure Authentication.	1	2
3	Access Controls	a1, b1, c2, d2	Access Control, Access Policies, Implementing Access Control: Reference Monitor, Access Control Directory, Access Control Matrix, Access Control List, Privilege List, Capability, Procedure-Oriented Access Control, and Role-Based Access Control.	1	2
4	Cryptography	a1,a2, b1, c2, d2	Cryptography Concepts and Terms, Cipher/Cryptography Types: Substitution, Transpositions, Stream, and Block Ciphers, Symmetric Encryption: Data Encryption	2	4

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			Standards(DES), Advanced Encryption Standards(AES)		
			Public Key Encryption: RSA, Hash Functions,		
			Cryptography Used: protected communications channels and to seal a file, Hash Function, Key Exchange, Digital Signature, Public Key Protocol, and Certificates Issue.		
5	Programs and Programming	a2, b1,b2, c1, d2	Introduction: programs, flaw, fault, failure and a taxonomy of program flaws. Unintentional (Nonmalicious) Programming oversights: buffer overflows, off-by-one errors, incomplete mediation, time-of-check to time-of-use errors. Malicious code: viruses, worms, Trojan horses. Countermeasures: Countermeasures for Users, Countermeasures for Developers (software engineering techniques, security life cycle, testing and testing types).	3	6
6	Web-User Side Attacks	a2, b1, c1,c2, d2	Browser Attacks and types, Web Attacks Targeting Users and Protecting	1	2

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			Against Malicious Web Pages. Obtaining User or Website Data. Email Attacks, and Protecting Against Email Attacks.		
7	Operating System Security	a2, b1, c2, d2	**Security in Operating Systems**: Operating System Structure, A Bit of History, Protected Objects, Operating System Tools to Implement Security Functions and Hardware Protection of Memory. **Rootkit**: Phone Rootkit, Rootkit Evades Detection, Rootkit Operates Unchecked, Sony XCP Rootkit, TDSS Rootkits, and Other Rootkits.	1.5	3
8	Network Security	a2, b1,b2, c1,c2, d2	**Threats to Network Communications:** interception, modification, fabrication, interruption, port scanning. **Wireless Network Security:** Vulnerabilities in Wireless Networks, WEP (Wired Equivalent Privacy), WPA (WiFi Protected Access), Denial of Service, and Distributed Denial-of-Service Concept.	2.5	5

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			Strategic Defenses: Security Countermeasures (categories of controls): Cryptography in Network Security: Network Encryption, Browser Encryption, Onion Routing, IP Security Protocol Suite (IPsec), Virtual Private Networks, System Architecture. network-protection tool: Firewall Concept. Intrusion detection system and prevention system Concept. Network Management: Management to Ensure Service, Security Information and Event Management (SIEM).		
9	**Individual/Group Project Presentation**	a1,a2, b1,b2, c1,c2, d1,d2		1	2
Number of Weeks /and Units Per Semester				14	28

B - Practical Aspect: (if any):				
Order	**Tasks/ Experiments**	**Number of Weeks**	**contact hours**	**Learning Outcomes**

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1	Introduction to information security	1	2	a1, c1, d2
2	Ethical Hacking, Social Engineering	1	2	b1, c1, d2
3	Installing OS (Kalilinux)	1	2	b1,b2, c1, d2
4	Scanning tools NMAP, ZENMAP	1	2	b1,b2, c1,c2,d2
5	Metasploit	1	2	b1,b2, c1,c2,d2
6	Network traffic sniffing	1	2	b2, c1,c2, d1
7	Session hijacking	1	2	b1,b2, c1,c2, d2
8	Password guessing and cracking	1	2	b1,b2, c1,c2, d2
9	Viruses	1	2	b1,b2, d2
10	SQL injection	1	2	b1,b2, c1,c2, d2
11	Data Encryption	1	2	b1, c2, d2
12	Privacy and Data Protection	1	2	b1, c2, d2
13	User Authorization Security	1	2	b1, c1, d2
14	Windows Security	1	2	b1,b2, c1,c2, d1,d2
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

Lecture

Exercises

Guided individual reading

Problem Solving in end of each Chapter,

Brainstorming.

Lab sessions

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Practical Report

Case Study

Individual/Group Project.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Homework and Problem-Solving Exercises	a1,a2, b2	Monthly	5
2	Technical Report	a1,a2, b1,b2, c1,c2, d1,d2	Monthly	5
3	Quizzes	a1,a2, b1,b2, c1,c2, d1,d2	Monthly	5
	Total			15

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignment	Monthly	15	15%	a1,a2, b1,b2, c1,c2, d2
2	Mid Term Exam (Theoretical)	6th	5	5%	a1,a2, b1,b2, c1
3	Mid Term Exam (Practical)	7th	5	5%	

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4	Individual/Group Students Projects	5th	5	5%	a1,a2, b1,b2, c1,c2, d1,d2
5	Final Semester Exam (Practical)	Related to a faculty time-table Exams 6th	10	10%	
6	Final Semester Exam (Theoretical)	Related to a faculty time-table Exams16th	60	60%	a1,a2, b1,b2, c1,c2
	Final Mark		**100**	**100%**	

VII. Learning Resources:

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

1- Required Textbook(s) (maximum two).

1. P. Pfleeger, Shari Lawrence Pfleeger and Jonathan Margulies, 2015, Security in Computing, 5th Edition, USA, Pearson Education, Inc.

2- Essential References.

1. Whitman, Michael; Mattord, Herbert , 2017, Principles of Information Security, 6th ed, Cengage Learning.
2. Charles P. Pfleeger and Shari Lawrence Pfleeger, 2012, Analyzing Computer Security: a threat/vulnerability/countermeasure approach, 1st Edition, USA, Pearson Education, Inc.
3. William Stallings, 2014, Cryptography and Network Security-Principles and Practice, 6th Edition, USA, Pearson Education, Inc.

3- Electronic Materials and Web Sites *etc*.

1. Lecture Notes,
2. http://www.gridsure.com
3. http://cve.mitre.org/
4. http://nvd.nist.gov/cvss.cfm
5. RSA Laboratories
6. https://www.omnisecu.com/security/index.php
7. https://www.tutorialspoint.com/itil/itil_information_security_management.htm
8. https://searchsecurity.techtarget.com/tutorial/Information-security-tutorials

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IX. Course Policies:	
	Unless otherwise stated, the normal course administration policies and rules of the Faculty of Computer and Information Technology apply. For the policy, see: ----------------------------------- The University Regulations on academic misconduct will be strictly enforced. Please refer to -----------
1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4	**Assignments & Project** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5	**Cheating:** For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism:** Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination.

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	- Lecture notes and assignments my given directly to students using soft or hard copy

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Faculty of Computer & Information Technology

Department of Computer Science

Program of Computer Science

Course syllabus of Information Security

Course No (...................)

2020/2021

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Template for Course Plan (Syllabus)

I. Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Computer and Information Technology (FCIT)	Office Hours					
Location &Telephone No.	Computer and Information Technology (FCIT)	SAT	SUN	MON	TUE	WED	THU
E-mail							

II. Course Identification and General Information:

1	Course Title:	Information Security					
2	Course Number & Code:						
3	Credit hours:	**C.H**				**Total**	
		Th.	Seminar	Pr.	Tr.		
		2		2		3	
4	Study level/year at which this course is offered:	3rd Level -1st Semester					
5	Pre –requisite (if any):	Computer Programming, Operating Systems and Network Fundamentals					
6	Co –requisite (if any):	None					
7	Program (s) in which the course is offered	Computer Science, Information Systems and Information Technology					

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8	Language of teaching the course:	Arabic/English
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11	Location of teaching the course:	Faculty of computer science and technology.

III. Course Description:

This course aims to student's acquiring a skills of maintain an information security properties through storing, processing and transmission. The course introduces the security properties, risks, vulnerabilities, threats and attacks and attacker types, authentication, access control, cryptography, software lifecycle, operating system security, networks and practical for develop, implement and manage a secure system to protect and defend information security resources.

IV.   Course Intended learning outcomes (CILOs) of the course

a.1	Explain the important of information security, security properties, risk, threats, vulnerabilities and attacks, access controls, authentication and security policies.
a.2	Describe a cryptography, lifecycle of a product and security considerations in system development, operating system roles, web and network security.
b.1	Explore and differentiate between threats, attacks, programs and programming oversights, security tools and techniques.
b.2	Analyze the impacts of threats, vulnerabilities and attacks on information security, and tradeoffs of balancing key security properties through a system development.
c.1	Employ a security product lifecycle in system development and make a security considerations in each stage to build a secure system according to needs.

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c.2	Solve a security problems and mange a security system to controls the access to computing security resources.
d.1	Work efficiently as a team member or individual according to ethical, legal, organization security policy, and responsibilities to perform a desired tasks.
d.2	Write a technical report related to information security topics.

V. Course Content:

A – Theoretical Aspect:

Order	Topics List	Week Due	Contact Hours
1	**Introduction:** Meaning of Security, Information Security Definition and Areas, Information Security Classification, Information Security Properties/Goals (Confidentiality, Integrity, Availability), Acts on Security Properties (Interception, Interruption, Modification, Fabrication) Information Security vulnerability, threats and attacks, Computer Crimes, Information Assurance model, Countermeasures/Controls.	1st	2
2	Authentication Identification Versus Authentication, Authentication Based on Phrase and Facts, Authentication Based on Biometric,	2nd	2

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3	Authentication Based on Token, Federated Identity Management, Multi Factors Authentication, Secure Authentication.		
3	Access Controls: Access Control, Access Policies, Implementing Access Control: Reference Monitor, Access Control Directory, Access Control Matrix, Access Control List, Privilege List, Capability, Procedure-Oriented Access Control, and Role-Based Access Control.	3rd	2
4	Cryptography: Cryptography Concepts and Terms, Cipher/Cryptography Types: Substitution, Transpositions, Stream, and Block Ciphers, Symmetric Encryption: Data Encryption Standards(DES), Advanced Encryption Standards(AES) Public Key Encryption: RSA, Hash Functions, Cryptography Used: protected communications channels and to seal a file, Hash Function, Key Exchange, Digital Signature, Public Key Protocol, and Certificates Issue.	4th,5th	4
5	**Mid Term Exam**	6th	2
6	Programs and Programming: Introduction: programs, flaw, fault, failure and a taxonomy of program flaws. Unintentional (Nonmalicious) Programming oversights: buffer overflows, off-by-one errors,	7th -9th	6

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	incomplete mediation, time-of-check to time-of-use errors. Malicious code: viruses, worms, Trojan horses. Countermeasures: Countermeasures for Users, Countermeasures for Developers (software engineering techniques, security life cycle, testing and testing types).		
7	Web-User Side Attacks: Browser Attacks and types, Web Attacks Targeting Users and Protecting Against Malicious Web Pages, Obtaining User or Website Data. Email Attacks, and Protecting Against Email Attacks.	10th -12th	3
8	Operating System Security: **Security in Operating Systems**: Operating System Structure, A Bit of History, Protected Objects, Operating System Tools to Implement Security Functions and HW Protection of Memory. **Rootkit**: Phone Rootkit, Rootkit Evades Detection, Rootkit Operates Unchecked, Sony XCP Rootkit, TDSS Rootkits, and Other Rootkits.	1.5	3
9	Network Security: **Threats to Network Communications:** interception, modification, fabrication, interruption, port scanning. **Wireless Network Security:** Vulnerabilities in Wireless Networks, WEP (Wired Equivalent Privacy), WPA (WiFi Protected Access), Denial of Service, Distributed Denial-of-Service Concept, Strategic Defenses: Security Countermeasures (categories of controls):	2	4

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	Cryptography in Network Security: Network Encryption, Browser Encryption, Onion Routing, IP Security Protocol Suite (IPsec), Virtual Private Networks, System Architecture. network-protection tool: Firewall Concept. Intrusion detection system and prevention system Concept. Network Management: Management to Ensure Service, Security Information and Event Management (SIEM).		
10	**Students Project Presentation**	1	2
11	**Final Exam**	1	3
	Number of Weeks /and Units Per Semester	**16**	**32**

B– Practical Aspect: *(if any)*			
Order	**Topics List**	**Week Due**	**Contact Hours**
1	Introduction to information security	1st	2
2	Ethical Hacking, Social Engineering	2nd	2
3	Installing OS (Kalilinux)	3rd	2
4	Scanning tools NMAP, ZENMAP	4th	2
5	Metasploit	5th	2
6	Network traffic sniffing	6th	2
7	Mid Term Exam	7th	2
8	Session hijacking	8th	2
9	Password guessing and cracking	9th	2

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10	Viruses	10th	2
11	SQL injection	11th	2
12	Data Encryption	12th	2
13	Privacy and Data Protection	13th	2
14	User Authorization Security	14th	2
15	Windows Security	15th	2
16	Final Exam	16th	2
Number of Weeks /and Units Per Semester			

VI. Teaching strategies of the course:

Lecture

Exercises

Guided individual reading

Problem Solving in end of each Chapter,

Brainstorming.

Lab sessions

Practical Report

Case Study

Individual/Group Project.

No	Assignments	Week Due	Mark
1	Homework and Problem-Solving Exercises	Monthly	5
2	Technical Report	Monthly	5

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3	Quizzes		Monthly	5
	Total			15

VII. Schedule of Assessment Tasks for Students During the Semester:

Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1	Assignment	Monthly	15	15%
2	Mid Term Exam (Theoretical)	6th	5	5%
3	Mid Term Exam (Practical)	7th	5	5%
4	Individual/Group Students Projects	5th	5	5%
5	Final Semester Exam (Practical)	Related to a faculty time-table Exams16th	10	10%
	Final Semester Exam (Theoretical)	Related to a faculty time-table Exams16th	60	60%
Final Mark			**100**	**100%**

VIII. Learning Resources:

1- Required Textbook(s) (maximum two).

1. P. Pfleeger, Shari Lawrence Pfleeger and Jonathan Margulies, 2015, Security in Computing, 5th Edition, USA, Pearson Education, Inc.

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2- Essential References.

1. Whitman, Michael; Mattord, Herbert , 2017, Principles of Information Security, 6th ed, Cengage Learning.
2. Charles P. Pfleeger and Shari Lawrence Pfleeger, 2012, Analyzing Computer Security: a threat/vulnerability/countermeasure approach, 1st Edition, USA, Pearson Education, Inc.
3. William Stallings, 2014, Cryptography and Network Security-Principles and Practice, 6th Edition, USA, Pearson Education, Inc.

3- Electronic Materials and Web Sites *etc*.

1. Lecture Notes,
2. http://www.gridsure.com
3. http://cve.mitre.org/
4. http://nvd.nist.gov/cvss.cfm
5. RSA Laboratories
6. https://www.omnisecu.com/security/index.php
7. https://www.tutorialspoint.com/itil/itil_information_security_management.htm
8. https://searchsecurity.techtarget.com/tutorial/Information-security-tutorials

I. Course Policies:

Unless otherwise stated, the normal course administration policies and rules of the Faculty of Computer and Information Technology apply. For the policy, see: ----------------------------------
The University Regulations on academic misconduct will be strictly enforced. Please refer to -----------

1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he will be considered as absent.
3	**Exam Attendance/Punctuality:**

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	A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4	**Assignments & Project** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5	**Cheating:** For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism:** Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments my given directly to students using soft or hard copy

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اللجنة الإشرافية

م.	الاســـم	الصــــفة	التوقيع
١	أ.م.د. عبد الماجد الخليدي	نائب عميد الكلية للشؤون الأكاديمية	
٢	أ.م.د. احمد مجاهد	نائب عميد مركز التطوير الأكاديمي وضمان الجودة	
٣	د. حسين الأشول	ممثل المركز في الكلية	
٤	أ.د. إبراهيم المطاع	نائب رئيس الجامعة للشؤون الأكاديمية	

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