Course Specification of Computer Networks

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
			Prof. Dr. Qassim Mohammed Abbas

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وحدة ضمان الجودة

I. Course Identification and General Information:

1	**Course Title:**	Computer Networks				
2	**Course Code & Number:**					
3	**Credit hours:**		**C.H**				**TOTAL**
			Th.	Seminar	Pr	Tr.	
			2	--	2	--	3
4	**Study level/ semester at which this course is offered:**	*2nd Year- 2nd Semester -*				
5	**Pre –requisite (if any):**	Introduction to Computer				
6	**Co –requisite (if any):**	None				
7	**Program (s) in which the course is offered:**	Computer Science, Information Technology, Information Systems				
8	**Language of teaching the course:**	English/Arabic				
9	**Study System**	Term Based System				
10	**Mode of delivery:**	Full Time				
11	**Location of teaching the course:**	Faculty of Computer and Information Technology				
12	**Prepared By:**	Dr. Sharaf Alhomdy				
13	**Date of Approval**					

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Prof. Dr. Qassim Mohammed Abbas

II.   Course Description:

This course primarily aims to acquit the student with basic concepts of computer and communication networking technologies. The topics includes the Internet, Protocols, Standards, networking architecture, OSI reference model & Internet Model (TCP/IP protocols), Transmission media, Data encoding/framing, error detection and correction, Flow control, Error control, Ethernet, Network layer protocols (IPv4 , IPv6) and wireless network fundamentals. Lab work focuses on basic information of network operating systems and implement simulation experience using packet trace simulator.

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III.	Course Intended learning outcomes (CILOs)	Referenced PILOs
a.1	Demonstrate deep knowledge of OSI & TCP/IP Models and different types of networking.	A3
a.2	Explain the various concept of data communication and techniques such as transmission media, data encoding/framing, error detection and correction, DLL protocols, IPv4, IPv6, TCP, UDP and routing and addressing**.	
b.1	Explore the network requirements of components, transmissions medium and communication protocols to meet desired need.	B1
b.2	Compare between OSI model & TCP/IP protocols .	B2
c.1	Employ the various concept of data communication, techniques tools and equipment to build or simulate a small network with acceptable levels of simplification.	C1 , C4
c.2	Implement different scenarios of computer network using simulation tools (packet trace or OPNET).	
d.1	Work effectively as a member of a group or individually to accomplish a common goal.	D1

(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- Demonstrate deep knowledge of OSI & TCP/IP Models and different types of networking.	Lecture Discussion	Mid term exam Final exam Homework
a2-Explain the various concept of data communication and techniques such as	Lecture	Mid term exam

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transmission media, data encoding/framing, error detection and correction, DLL protocols, IPv4, IPv6, TCP, UDP and routing and addressing.	Discussion	Final exam Homework

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(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 the network requirements of components, transmissions medium and communication protocols to meet desired need.	Lecture Seminar/Presentation	.
b2- Compare between OSI model & TCP/IP protocols .	Lecture Seminar Exercises Group discussions Problem-solving	Written examinations, Assignments Problem-solving exercise.

© 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-. Implement different scenarios of computer network using simulation tools (packet trace or OPNET).	Lab sessions Exercises Group discussions Problem-solving.	Written examinations (lab). Individual and group project work.
c2- Employ the various concept of data communication, techniques tools and equipment to build or simulate a small	Interactive lecture Lab sessions Exercises	Written examinations. Technical or practical reports /Presentations.

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network with acceptable levels of simplification.	Group discussions problem-solving	Individual and group project work.

(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 effectively as a member of a group or individually to accomplish a common goal.	Guided individual reading. Group discussions Seminar/presentation	Technical reports Presentations.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Introduction	a1, b1	- Review on topology - Define Data communication and network - Type of networks (LAN, MAN, WAN) - the Internet history - define protocols and Standards - Circuit switching and Packet switching and the difference between them	1	2
2	Network Models	a1, a2, b2, c1	- OSI model (7 layer model, functions of layers) - TCP/IP protocol suite - Comparing the OSI model and TCP/IP model	2	4
3	Transmission Media	a2, b1, c2	- Guided Media (Twisted-pair cable, Coaxial cable, Fiber optic cable) - Unguided Media (Radio waves, Microwaves, Infrared, leaser)	1	2

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			- Different type of antenna		
4	Data Link Layer	a2, b1, c2, d1	- Types of errors - Error detection and correction - Coding technique - Using Hamming Distance - Combining Hamming Distance and Interleaving - Framing	2	4
6	Data Link Layer	a1, a2, b1, b2, c2	- Flow and error control (Flow control, Error control, Flow and error control mechanism) - Stop-and-wait ARQ - Go-back-n ARQ - Selective repeat ARQ - HDLC	1	2
7	Local Area Networks	a1, b2, c2	- Traditional Ethernet - Fast Ethernet - Gigabit Ethernet - Bridging.	1	2
8	Network layer protocols	a2, b1, b2, c1, c2	- ARP (Mapping, Packet Format, Encapsulation, Operation) - TCP and UDP protocol - IPv4 (Datagram, Fragmentation) - IPv4 ADDRESSES (Classful Addressing , Classless Addressing, Network Address Translation, Subnetting address) - ICMP (Types of messages) - IGMP protocol - SSL protocol - IPv6 (IPv6 addresses, Categories of addresses, IPv6 packet format, Fragmentation, ICMPv6 - Transition from IPv4 to IPv6)	4	8
9	Wireless Network	a1, b1, c2	Introduction to WI-FI	1	2
10	Review and project discussion	a1, a2, b1, b2, c2, d1	Project discussion	1	2
Number of Weeks /and Units Per Semester				**14**	**28**

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B - Practical Aspect: (if any)

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	-Review on different topologies -Practice on cable and use equipment's to create or build small network with acceptable levels of simplification.	2	4	a1, b1, c1
2	-Install and use operating system such as window server or Linux. - Install simulation software.	2	4	b1, c1, d1
3	- Classes and subnetting -Divide the networks to subnetting -identify the IP Address.	2	4	a2, b2, c2, d1
4	**Mid-term exam**	1	2	a1, a2, b1, c1, c2
5	Implement different scenarios on computer network using simulation.	1	2	a2, b2, c1, d1
6	Use current techniques, skills, and tools necessary to simulate subnetting network .	3	6	b2, c2, d1
7	Training on configuration of hub/switch, wireless access point and protocols such as FTP, Tenet etc…	2	4	a2, b1, b2, c2, d1
8	Project discussions	1	2	a1, a2, b1, b2,c1, c2, d1
9	**Final exam**	1	2	a1, a2, b1, b2,c1, c2

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Number of Weeks /and Units Per Semester	15	30	

V. Teaching strategies of the course:

Lecture\Interactive lecture

Lab sessions

Exercises

Group discussions

problem-solving

Seminar/Presentation

Guided individual reading.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Determine the requirements of building a different types of network.	a2, b1, c1	4th to 8th	5
2	Build different network scenarios using network simulation tools.	a2, b2, c2	4th to 12th	10
3	Lab-reports	a2, b1, c2, d1	2th ,4th ,8th ,10th	5
	Total			20

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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	Assignments	2th , 4th to 12th	20	20%	a2, b1, b2, c1, c2, d1
2	Mid-term exam (Lab)	7th	5	5%	a2, b1, c1, c2
3	Mid-term exam (Theory)	7th	10	10%	a1, a2, b1, b2, c2
4	Final exam (Lab)	15th	5	5%	a1, a2, b1, b2, c1, c2
5	Final exam (Theory)	16th	60	60%	a1, a2, b1, b2, c1, c2
	Total		100	100%	

VIII. Learning Resources:

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

1- Behrouz A. Forouzan (2013), "Data Communications and Networking",5/e McGraw-Hill Companies, Inc, ISBN: 0072967757.
2- James F. Kurose, Keith W. Ross, (2020), "Computer Networking: A Top-Down Approach", 7th Edition, ISBN-10: 0-321-49770--8, Addison-Wesley.

2- Essential References.

1- Joseph Davies, (2012) "Understanding IPv6: Your Essential Guide to IPv6 on Windows Networks", 3rd Edition, Microsoft Corporation, USA.
2- R. Perlman, "Interconnections, Bridges, Routers, Switches, and Internetworking *Protocol*s", Addison Wesley, 2nd edition.

3- Electronic Materials and Web Sites *etc*.

1- The Network Simulator - ns-2, http://www.isi.edu/nsnam/ns/
2- OPNET Modeler, https://www.opnet.com/solutions/network_rd/modeler.html

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IX. Course Policies:

1	Class Attendance: - According to university rules that determine the attendance policy , the adoption of absence and how and when to deprive the student of maturity (the student must attend at least 75% of the number of lectures).
2	Tardy: - Late attendance is determined by the policy in cases of recurrences delayed depriving the student to attend some educational activities by the teacher.
3	Exam Attendance/Punctuality: - According to the university rules which determines attendance policy, delays and absence from the test
4	Assignments & Projects: - Determine the policies followed in cases of delay in submitted homework & projects and when it should be delivered to the teacher.
5	Cheating: - According to the university rules
6	Plagiarism: - According to the university rules
7	Other policies: The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.

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Faculty of Computer & Information Technology

Department of Computer Science

Program of Computer Science

Course Specification of Computer Networks

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

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I. - Information about Faculty Member Responsible for the Course:

Name of Faculty Member		Office Hours						
		SAT	SUN	MON	TUE	WED	THU	
Location& Telephone No.								
E-mail								

II. Course Identification and General Information:

1	Course Title:	Computer Networks				
2	Course Code & Number:					
3	Credit hours:	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2	--	2	--	3
4	Study level/ semester at which this course is offered:	2nd Year- 2nd Semester				
5	Pre –requisite (if any):	Introduction to Computer				
6	Co –requisite (if any):	None				
7	Program (s) in which the course is offered:	Computer Science, Information Technology, Information Systems				
8	Language of teaching the course:	English/Arabic				
9	Study System	Term Based System				

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10	**Mode of delivery:**	Full Time
11	**Location of teaching the course:**	Faculty of Computer and Information Technology

III. Course Description:

This course primarily aims to acquit the student with basic concepts of computer and communication networking technologies. The topics includes the Internet, Protocols, Standards, networking architecture, OSI reference model & Internet Model (TCP/IP protocols), Transmission media, Data encoding/framing, error detection and correction, Flow control, Error control, Ethernet, Network layer protocols (IPv4 , IPv6) and wireless network fundamentals. Lab work focuses on basic information of network operating systems and implement simulation experience using packet trace simulator.

IV. Intended learning outcomes (ILOs) of the course:

a1. Demonstrate deep knowledge of OSI & TCP/IP Models and different types of networking.

a2. Explain various concept of data communication and techniques such as transmission media, data encoding/framing, error detection and correction, DLL protocols, IPv4, IPv6, TCP, UDP and routing and addressing**.**

b1. Explore the network requirements of components, transmissions medium and communication protocols to meet desired need.

b2. Compare between OSI model & TCP/IP protocols .

c1. Employ the various concept of data communication, techniques tools and equipment to build or simulate a small network with acceptable levels of simplification.

c2. Implement different scenarios of computer network using simulation tools (packet trace or OPNET).

d1. Work effectively as a member of a group or individually to accomplish a common goal.

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V. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	contact hours
1	Introduction	- Topologies - Define Data communication and network - Type of networks (LAN, MAN, WAN) - the Internet history - define protocols and Standards - Circuit switching and Packet switching and the difference between them	1st	2
2	Network Models	- OSI model (7 layer model, functions of layers) - **TCP/IP protocol suite** - Comparing the OSI model and TCP/IP model	2nd,3th	4
3	Transmission Media	- Guided Media (Twisted-pair cable, Coaxial cable, Fiber optic cable) - Unguided Media (Radio waves, Microwaves, Infrared, leaser) - Different type of antenna	4th	2
4	Data Link Layer	- Types of errors - Error detection and correction - Coding technique - Using Hamming Distance - Combining Hamming Distance and Interleaving - Framing	5th,6th	4
5	Mid-term Exam	- Exam	7th	2
6	Data Link Layer	- Flow and error control (Flow control, Error control, Flow and error control mechanism) - Stop-and-wait ARQ - Go-back-n ARQ - Selective repeat ARQ - HDLC	8th	2
7	Local Area Networks	- Traditional Ethernet - Fast Ethernet - Gigabit Ethernet	9th	

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		- Bridging.		2
8	Network layer protocols	- ARP (Mapping, Packet Format, Encapsulation, Operation) - TCP and UDP protocol - IPv4 (Datagram, Fragmentation) - IPv4 ADDRESSES (Classful Addressing , Classless Addressing, Network Address Translation, Subnetting address) - ICMP (Types of messages) - IGMP protocol - SSL protocol - IPv6 (IPv6 addresses, Categories of addresses, IPv6 packet format, Fragmentation, ICMPv6 - Transition from IPv4 to IPv6)	10th - 13th	8
9	Wireless Network	Introduction to WI-FI	14th	2
10	Review and project discussion	Project discussion	15th	2
11	Final Exam	Exam	16th	2
Number of Weeks /and Units Per Semester			**16**	**32**

B - Practical Aspect: (if any)

Order	Tasks/ Experiments	Week Due	contact hours
1	-Review on different topologies -Practice on cable and use equipment's to create or build small network with acceptable levels of simplification.	$1^{st},2^{nd}$	4
2	-Install operating system such as window server or Linux. - Install simulation software.	$3^{rd},4^{th}$	4

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3	- Classes and subnetting -Divide the networks to subnetting -identify the IP Address.	5th,6th	4
4	**Mid-term exam**	7th	2
5	Implement different scenarios on computer network using simulation.	8th	2
6	Use current techniques, skills, and tools necessary to simulate subnetting network .	9th-11th	6
7	Training on configuration of hub/switch, wireless access point and protocols such as FTP, Tenet etc…	12th ,13th	4
8	Project discussions	14th	2
9	**Final exam**	15th	2
Number of Weeks /and Units Per Semester		**15**	**30**

VI. Teaching strategies of the course:

Lecture\Interactive lecture

Lab sessions

Exercises

Group discussions

problem-solving learning

Seminar/Presentation

Guided individual reading

VII. Assignments:

No	Assignments	Week Due	Mark

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1	Determine the requirements of building a different types of network..	4th to 8th	5
2	Build different network scenarios using network simulation tools.	4th to12th	10
3	Lab-reports	2th,4th,8th,10th	5
	Total		20

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Assignments	2th , 4th to 12th	20	20%
2	Mid-term exam (Lab)	7th	5	5%
3	Mid-term exam (Theory)	7th	10	10%
4	Final exam (Lab)	15th	5	5%
5	Final exam (Theory)	16th	60	60%
	Total		100	100%

IX. Learning Resources:

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

1- Behrouz A. Forouzan (2013), "Data Communications and Networking",5/e McGraw-Hill Companies, Inc, ISBN: 0072967757.
2- James F. Kurose, Keith W. Ross, (2020), "Computer Networking: A Top-Down Approach",7th Edition, ISBN-10: 0-321-49770--8, Addison-Wesley.

2- Essential References.

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1- R. Perlman, "*Interconnections, Bridges, Routers, Switches, and Internetworking Protocols*", Addison Wesley, 2nd edition.
2- Joseph Davies, (2012) "Understanding IPv6: Your Essential Guide to IPv6 on Windows Network*s*", 3rd Edition, Microsoft Corporation, USA.

3- Electronic Materials and Web Sites *etc*.

1- The Network Simulator - ns-2, http://www.isi.edu/nsnam/ns/
2- OPNET Modeler, https://www.opnet.com/solutions/network_rd/modeler.html

X.	Course Policies:
1	Class Attendance: - According to university rules that determine the attendance policy , the adoption of absence and how and when to deprive the student of maturity (the student must attend at least 75% of the number of lectures).
2	Tardy: - Late attendance is determined by the policy in cases of recurrences delayed depriving the student to attend some educational activities by the teacher.
3	Exam Attendance/Punctuality: - According to the university rules which determines attendance policy, delays and absence from the test
4	Assignments & Projects: - Determine the policies followed in cases of delay in submitted homework & projects and when it should be delivered to the teacher.
5	Cheating: - According to the university rules
6	Plagiarism: - According to the university rules
7	Other policies: The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.

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اللجنة الإشرافية

م.	الاســـم	الصــــــفة	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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