MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Information Theory and coding**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4101**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	CET		**College**	EETC	
Module Leader	Name: Mahmood Farhan Mosleh		**e-mail**	E-mail: drmahmoodfarhan@gmail.com	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Asst. Prof. Dr. Oras Ahmed Shareef		**e-mail**	dr.oras@mtu.edu.iq	
Peer Reviewer Name	Asst. Prof. Alhamzah Taher Mohammed		**e-mail**	alhamza_tm@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop problem solving skills and understanding of information theory through the application of techniques. 2. To understand the information representation. 3. This course deals with the basic concept of source coding. 4. To represent the information depending on the probabilities of events. 5. To compress the data by various types of compression. 6. To detect and correct the errors using channel coding methods.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Having a skill to calculate the probability of any event. 2. Modeling the information transmission system. 3. Defined the information of noisy channel and posteriori probabilities. 4. Representation the information source based on Shannon . 5. Measure the information using entropies. 6. Represent various types of channel model. 7. Measure the entropy for various distribution methods. 8. Having a skill of modeling various types of channels as a matrix. 9. Measure the capacity of various types channels. 10. Improve the data rate using various types of source code algorithms. 11. Having a basic skill of error detection and corrections
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Information theory</u> Random variable, Shannon representation method, entropy, Information transmission system. Source entropy, Marginal Entropy. [20hrs] <u>Part B – Channels</u> Types of channel model, channel matrix, Channel capacity. [20 hrs] <u>Part C – Source Coding</u> Fixed and variable length code, types of source code, measure of code efficiency, data compression, [25hrs] <u>Part d – Channel Coding</u> Need for channel code, redundancy data, block code, convolutional codes Revision problem classes for each above classes [20 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.73
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	4, 12	LO #1-3, LO #4-9
	Assignments	2	10% (10)	3, 12	LO # 1,2 , LO#3-8
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 1-10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	10	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Review of related probability and statistics related topics.
Week 2	Model of information transmission system. Common sense definition of information Logarithmic measure of information. Self-information.
Week 3	Shannon representation diagram of information source. Parameters of discrete channel.
Week 4	Average information (entropy) of a discrete and continuous source, maximum source entropy. Source efficiency
Week 5	Transition probability matrix of channel, discrete noiseless and noisy channel models, uniform channel. Ternary symmetric channel.
Week 6	Information transmission over symmetric channel, noiseless channel, binary symmetric channel, ternary symmetric channel.
Week 7	Memory and memory less information channels .Binary Erasure channel (BEC).
Week 8	Capacity of discrete channel, channel capacity for noiseless channel. Channel efficiency and redundancy. Channel capacity for symmetric channels.
Week 9	Sampling of continuous source. Sampling Theorem. Nyquist theorem for transmission over band limited continuous channel. Shannon-Hartly channel capacity theorem.
Week 10	**Midterm Exam**
Week 11	Source encoding; fixed and variable length codes. Prefix property. Average length of source code. Source code efficiency and redundancy. Fano coding, Shannon- Fano methods.
Week 12	Huffman code, data compression
Week 13	Channel Coding in Digital Communication Systems. Forward Error Correction (FEC)
Week 14	Block codes. Cyclic Redundancy Check (CRC)
Week 15	Repetition Codes, Single Parity Check Codes

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Self information measurements
Week 2	Lab 2: Entropy measuring for multi-messages
Week 3	Lab 3: Mutual information measurements.
Week 4	Lab 4: Various channel representation.
Week 5	Lab 5: Losses channel measurements
Week 6	Lab 6: Data Compression applications
Week 7	Lab 7: Channel losses measurements

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thomas M. Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons, Inc. 1991	Yes
Recommended Texts	Coding Theory: Algorithms, Architectures, and Applications, Andreu Neubbauer, John Wiley & Sons, 2007	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer Networks Protocols**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4102**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	CET		**College**	EETC	
Module Leader	Mohamed Ibrahim .Shujaa		**e-mail**	drshujaa@mtu.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Ammar Alauldeen Abdulmajeed		**e-mail**	Ammar.all@mtu.edu.iq	
Peer Reviewer Name	Dr. Mahmoud Shuker Mahmoud		**e-mail**	mahmoud.shukur@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Computer Network fundamental	**Semester**	6
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Prepare network engineers who can prepare and design all types of networks. 2. This course teaches modern and advanced curricula in the field of computer networks. 3. Providing high-quality modern research that can be applied in the field of computer networks and the Internet. 4. Provides appropriate solutions to the problems of design and installation of networks and choose the best protocols.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enable the students to apply their knowledge and skills in the field of computer networks to find practical solutions to any problems in this field and to be able to make appropriate decisions in the field of work. 2. Summarize the OSI model with all functions and objectives. 3. Discuss the protocols of each layer and its function and work. 4. Describe the network algorithms in the entire OSI model. 5. Describe the errors in networking communication. 6. Identify the solution for routing and forwarding in the network. 7. Discuss the explain the security of the network. 8. Discuss the protocols that deal with routing and security. 9. Explain the TCP/IP model and its relationship with the OSI model 10. Analyze, discuss, and use Network test results in the design and evaluation topology processes.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – OSI Network Model</u> Layering model. functions of each layer, Services, general view of each protocol in each layer, and functions of each protocol regarding each layer. [15 hrs] Physical layer and transmission, Data link layer and Errors, Algorithms of data link layers. [15 hrs] The network layer of the OSI model, Function and services, Routing Algorithm, protocol algorithm, and application, network failure and delay, [15 hrs] Error's function, Network failure, and solutions. [10 hrs]

	Revision problem classes [6 hrs] Part B – Protocols of OSI model Protocol of each layer in details, function and services, experimental application [15 hrs] Switching routing. Components and experimental switching and algorithms. [7 hrs] The transport layer, functions protocols, protocols application, and flow experiment. [5 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the simulation experiment, and tutorial lectures while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving networking activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1-3, LO #3-7
	Assignments	2	20% (10)	3, 12	LO # 1-3, LO#3-8
	Projects / Lab.	1	10% (10)	Continuous	
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Protocol Hierarchies in OSI model: (Application layer, presentation layer, session layer, transport layer, network layer, datalink layer. Physical layer) basics. PDU
Week 2	Physical Layer Protocols, Protocol Design Issues, Transmission, and Multiplexing Protocol Functionality, Layering, and Framework (SP3)
Week 3	Link layer: Services Provided by the Link Layer, Multiple Access Links and HDLC Protocols, Taking-turns protocols,
Week 4	Link layer Error control and flow control algorithms MAC Protocols (Ethernet, DSL, ISDN, FDDI) ; CSMA/CD
Week 5	**Link layer:** Types of errors, Checksum algorithms CRC, MAC, Switch, ARP, L2TP, PPP **Network Layer** Protocols, Concepts, and Routing Algorithms.
Week 6	**Network Layer Protocols -** OSPF routing, EIGRP routing Rip, BGP, ICMP, DHCP
Week 7	**Midterm Exam**
Week 8	Network Protocols: RIP, BGP, ICMP, and DHCP. **Network layer components** Routing Algorithms (LS, DV)
Week 9	IP (Internet Protocol), IP Datagram Fragmentation IPv4, IPv6, IPsec
Week 10	Transport Layer Protocols Design Congestion Control, Flow Control- Services
Week 11	MUX, DMUX, Connectionless, Connection Oriented. TCP/UDP Analysis and Implementation
Week 12	**Presentation Protocols:** Security Protocols (SSL, SSH)

Week 13	Application Layer Protocols (Architecture, services)
Week 14	Protocols: WWW (HTTP, HTTPs, FTP, DHCP,)
Week 15	**TCP/ IP Model & Protocols Stack** Electronic Mail Protocols (SMTP, POP) DNS, Telnet protocols

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Cisco packet tracer and configuration Review
Week 2	Lab 2: VLAN network
Week 3	Lab 3: Inter-VLAN Techniques
Week 4	Lab 4: Static Routing Protocol
Week 5	Lab 5: Dynamic Routing Protocol (RIP)
Week 6	Lab 6: Dynamic Routing Protocol (RIP)
Week 7	Lab 7: DHCP,
Week 8	Lab 8: HTTP,DNS Protocol
Week 9	Lab 9: IPv6
Week 10	Lab 10: Router and Switch Security

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	: **Computer Networking A Top Down Approach.** **Author :** James F. Kurose, Keith W. ross **Edition/Publisher/year :** 6th ,7th edition /Pearson 2013,2018	Yes
Recommended Texts	Internetworking with TCP/IP Author : Douglas E. corner	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mobile Communications**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4103**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	CET		**College**	EETC	
Module Leader	Alhamzah Taher Mohammed		**e-mail**	alhamza_tm@mtu.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Zahraa Abbas Hamza		**e-mail**	Zahraaabbasct91@gmail.com	
Peer Reviewer Name	Dr. Osama Abbas Hussein		**e-mail**	osama.abbas@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**Digital Communications**	**Semester**	5
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	It is aimed at students on the fourth stage definition - Concepts and terminology used in cellular systems - The study of developments in the generation cellular system - How to design cells - How to cover all the cell by signal and at all spaces - Types of modulation signal in Cellular Communications - Wireless systems construction, design and processing of interference signals - explain Multiple Access Techniques
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Identify concepts and terms used in cellular systems 2- Explain the signal analysis and how coverage in each cell 3- compare between all generations and how they evolve 4 Explain the internal structural study of the cells 5- Discuss the Hand off Strategies 6- Design cellular system 7- Discuss the how to cover the signal to all the cells 8- Explain how can small number of channels can accommodate large number of random users 9- Design, planning and analysis of the signals for sending and receiving 10 explain Modulate a digital signal and demodulation as Multiple Access
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - **Introduction to Wireless Communication System (10 hr)** - **The Cellular Concept-System Design Fundamentals (24 hr)** - **Traffic Engineering (10 hr)** - **Large scale path loss (15 hr)**

	- **Multiple Access Techniques (15 hr)**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	86	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.73
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	10% (10)	3	LO #1- 3
	Assignments	1	10% (10)	12	LO #1- 9
	Projects / Lab.	10	10% (1)	Continuous	LO #1-10
	Report	10	10% (1)	Continuous	LO #1-10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Evolution of mobile communications, Mobile Radio System around the world
Week 2	Types of Wireless communication System
Week 3	Trend in Cellular radio and personal communication, 1^{st} , 2^{nd} ,3^{rd} 4^{th} ,5^{th} generations
Week 4	Cellular system, Hexagonal geometry cell and concept of
Week 5	frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio
Week 6	Channel & co-channel interference reduction factor,
Week 7	S/I ratio consideration and calculation for Minimum Co-channel and adjacent interference
Week 8	**Midterm Exam**
Week 9	Handoff Strategies .Trucking and Grade of Service,
Week 10	Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization
Week 11	Free Space Propagation loss equation, Path-loss of NLOS and LOS systems,
Week 12	Link budget design
Week 13	Frequency Division Multiple Access (FDMA). Time Division Multiple Access (TDMA).
Week 14	Wi-Fi, WiMAX, ZigBee Networks
Week 15	Software Defined Radio, UWB Radio

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Digital Communications-BPSK Modulation ,
Week 2	QPSK modulation, 16 QAM Modulation
Week 3	Implement Communication System Compute the system's BER & Computing the Symbol Error Rate (cellular terms)
Week 4	Wireless link , path loss calculation
Week 5	Link budget design
Week 6	Frequency Division Multiple Access (Multiplexing & DeMultiplexing)
Week 7	Time Division Multiple Access(Multiplexing & DeMultiplexing)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	- Mischa Schwartz, Mobile Wireless Communications, Cambridge University Press 2005	No
Recommended Texts	- J. G. Proakis, Digital Communications, 4th ed. NY: McGraw Hill, 2000	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Engineering Management**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4104**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	CET		**College**	EETC	
Module Leader	Rawaa dawood Salim		**e-mail**	rawaadawood@mtu.edu.iq	
Module Leader's Acad. Title	Asst. lecturer		**Module Leader's Qualification**	MSC.	
Module Tutor	Husam Fahmy Agamy		**e-mail**	Husam.fahmy@mtu.edu.iq	
Peer Reviewer Name	Asst. Prof. Alhamzah Taher Mohammed		**e-mail**	alhamza_tm@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Knowledge of the main concepts and elements of project management. 2. Knowing the ways to draw network diagrams for projects 3. Knowledge and understanding of the linear programming process for engineering projects 4. Knowing the methods of calculating the cost per unit of production and finding the break-even point. 5. Knowing the Economics for the engineers. 6. To understand the Productivity.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. List the element of engineering management. 2. Define the Economics for the engineers 3. Drawing the Gantt Chart. 4. Knowing how to draw network diagrams for the project. 5. Knowledge of project critical path finding, project total tolerance, early and late start, the early and late end of the activities in the project. 6. Define Project Evaluation and Review Technique (PERT). 7. Identify standard deviation and variants. 8. Crashing of project network. 9. Knowing and understanding the Linear programming: graphical method 10. Knowing, understanding linear programming: simplex method. 11. Knowing, understanding and drawing the break-even point of the project. 12. Knowing the Productivity
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Introduction of management**, main elements of project management, steps/phases of project management, Economics for the engineers [10 hrs.] **Gantt Chart, Networks,** activity on arrow, activity on anode [10 hrs.] **Critical path method**, Cp, float, early start, early finish, late start, late finish(CPM) [10hrs] **Pert technique(Time-Cost)** Pert technique Expected time, slack, standard deviation and variants, the probability, crashing of project [16 hrs.] **Linear programming**: graphical method, Linear programming: simplex method [15 hrs.] **The break-even point Productivity**. [10 hrs.]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. Daily evaluations- quarterly evaluations- finally evaluations- practical evaluations- presentation evaluations- attend daily- weekly reports.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1-4 , LO #5-9
	Assignments	2	10% (10)	3, 12	LO # 1,2, LO#3-10
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 1-12
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of management
Week 2	Economics for the engineers
Week 3	Gantt Chart
Week 4	Networks
Week 5,6	Critical path method(CPM)
Week 7	Mid-term Exam
Week 8,9,10	Pert technique(Time-Cost)
Week 11	Linear programming: graphical method
Week 12,13	Linear programming: simplex method
Week 14	The break-even point
Week 15	Productivity

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Microsoft Project
Week 2	Setup a New project
Week 3	Creating a Calendar for the project
Week 4	Adding tasks to the project
Week 5	Set up resources
Week 6	Formatting and sharing a plan
Week 7	View and report project status

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	J.R. Meredith and S.J. Mantel “Project Management”, J. Wiley & Sons, 1995.	No
Recommended Texts	Y. Bakouros and V. Kelessidis “Project management” INNOREGIO: dissemination of innovation and knowledge management techniques, January 2000	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Artificial Intelligence**			**Module Delivery**	
Module Type	**Elective**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4105**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	CET		**College**	EETC	
Module Leader	Ammar Hussein Mutlag		**e-mail**	ammar_alqiesy@mtu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Dr. Mohammed Joudah Zaiter		**e-mail**	mjzaiter@mtu.edu.iq	
Peer Reviewer Name	Dr. Mahmoud Shuker Mahmoud		**e-mail**	mahmoud.shukur@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1- Provides a comprehensive introduction to artificial intelligence (AI) and neural networks. 2- Learn the fundamentals of AI, including problem-solving, reasoning, knowledge representation, and machine-learning techniques. 3- Study the various types of neural networks and their architectures. 4- Demonstrate the applications in real-world scenarios. 5- Gain hands-on experience in implementing and training neural networks using popular frameworks and tools.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the principles and theories underlying artificial intelligence. 2- Explain the concepts of machine learning, including supervised, unsupervised, and reinforcement learning. 3- Demonstrate proficiency in programming languages commonly used in AI and neural network applications. 4- Understand the fundamental concepts and principles of artificial neural networks (ANNs). 5- Explain the architecture and components of different types of ANNs, 6- Design and implement neural network architectures for various tasks, such as classification, regression, and pattern recognition. 7- Train and optimize neural networks using appropriate algorithms and techniques. 8- Evaluate and compare the performance of different neural network models using appropriate evaluation metrics. 9- Understand the limitations and challenges associated with training and deploying neural networks. 10- including feedforward, recurrent, and convolutional neural networks. 11- Optimize ANNs using appropriate algorithms and techniques, such as gradient descent and backpropagation. 12- Explore the applications of ANNs in different fields.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Introduction to Artificial Intelligence [5 hrs] History and evolution of AI, AI applications and impact on society, AI problem-solving approaches. 2- Machine Learning Fundamentals [5 hrs] Supervised, unsupervised, and reinforcement learning; Training, validation, and testing of machine learning models; Evaluation metrics for assessing model performance. 3- Neural Networks Basics [25 hrs] Fundamentals of biological Neural Networks, basic principles of ANNs, and their early structures; Properties of ANN, advantages, and disadvantages; Types of learning rules, learning algorithms, training styles

	4- Neural Networks Algorithms [25 hrs] Hebb Network, Perceptron, and activation functions; Feedforward neural networks and backpropagation algorithm; Optimization algorithms (e.g., gradient descent) 5- Introduction to Deep Learning and Convolutional Neural Networks [5 hrs] Introduction to deep learning; Convolutional neural networks (CNNs) and their architectures; Image classification and object recognition using CNNs.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب موزع على (15) اسبوع

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	4, 12	LO #1-4 and 5-7
	Assessment	2	10% (10)	5,10	LO #1-3 and 4-8
	Seminar	1	10% (10)	Continuous	All
	Projects / Lab.	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	9	LO # 1-8
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Artificial Intelligence
Week 2	Machine Learning Fundamentals
Week 3	Fundamentals of Biological Neural Networks, and their early structures
Week 4	Properties of ANN, advantages, and disadvantage
Week 5	Network architectures, logic gates
Week 6	Types of learning rules, learning algorithms, training styles
Week 7	Hebb Net, Applications,
Week 8	Character recognition
Week 9	Mid Term Exam
Week 10	Perception: Architecture, Algorithm, Applications
Week 11	Adaline: Architecture, Algorithm, Applications
Week 12	Mdaline: Architecture, Algorithm
Week 13, 14	Backpropagation Neural Network: Architecture, Algorithm, Applications
Week 15	Introduction to Deep Learning and Convolutional Neural Networks

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	McCulloch-Pitts neurons: Logic Functions
Week 2	Hebb Net: Logic Functions (Binary input and output, Binary input and bipolar output, bipolar input and output)
Week 3	Hebb Net: Character recognition (Two-dimensional input pattern with different letters)
Week 4	Perceptron for different logic functions
Week 5	Adaline for different logic functions
Week 6	Backpropagation for different architecture: Logic gate
Week 7	Backpropagation for different architecture: real applications
Week 8	Image classification and object recognition using CNNs.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig.	No
Recommended Texts	-	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Web Design**			**Module Delivery**	
Module Type	**E**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4106**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	CET		**College**	EECT	
Module Leader	Dr. Mahmoud Shuker Mahmoud		**e-mail**	mahmoud.shukur@mtu.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Mohanad Ahmed Mezher		**e-mail**	mohanad.ahmed1@mtu.edu.iq	
Peer Reviewer Name	Dr. Osama Abbas Hussein		**e-mail**	osama.abbas@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. This course will introduce students to the realm of web design. : page composition, XHTML, CSS, web design and code validation. 2. Students will cover the Web design/development process. 3. Topics covered include basic and enhanced site structure, local and remote site management, and optimization of Web-site performance. 4. Provides appropriate knowledge to web servers and browsers of the internet and network communication.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Be able to use the HTML programming language, Resolves written HTML codes, Runs the page he/she has designed using HTML codes 2. Create an Information Architecture document for a web site, 3. Construct a web site that conforms to the web standards of today and includes e-commerce and web marketing. 4. Publish the website to a remote server using FTP. 5. Perform regular web site maintenance (test, repair and change). 6. Uses Domain Name and services 7. Be able to make changes on the Site. 8. Updates on the site when needed 9. Be able to use the Design Programs. 10. Designs and publish websites.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Web Designer Specific skills would be design-tools-of-choice, HTML, CSS, and light JavaScript., [10 hrs] Front End Developer. focused on HTML, CSS, JavaScript, and light backend work. The lack of "designer" concepts beyond the core technologies, for instance regression testing or performance. [10 hrs] Technology specific job titles "JavaScript Developer" or "JavaScript Engineer" for a job where that is primarily what needs to be done., [10 hrs] UI Designer, light on HTML and CSS skill, A synonym might be a Visual Designer. [10 hrs] UX Designer, studying and researching how people use a site. Then ushering changes

	for the better through the system and testing the results, [5 hrs] Part B – internet Architecture and publishing Interaction Designer, Primarily design, just like a UI Designer, but with specific focus on how things are used and moved. [10 hrs] Web Developer, This job is focused on back end work and working with languages specific to the web, like PHP, ASP, Ruby, Python, etc. Medium skill in database/server work [10 hrs] Full Stack Developer. The structural design of websites like the taxonomies, metadata, scheduling, and analysis of content. A synonym might be Information Architect. [8 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course will combine guided core reading, a series of short individual tasks, synchronous and asynchronous discussions, group working, resource sharing and hands -on experience on website development. Tutor support will be provided throughout the course. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving Designing that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1-3, LO# 3-8
	Assignments	2	10% (10)	3, 12	LO #1,2, LO# 3-7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 1-10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to HTML :** Introduction to Internet programming, HTML language, Description and running through IE, How to write codes in HTML?, Headings, titles. The body in HTML language, background colors, pages and breaks
Week 2	**Lists & Tables in HTML language :** Ordered list and unordered list, creating table, table attributes and features, **Images :** Images , Combining paragraphs with table and images.
Week 3	**Forms in HTML I :** Command buttons, Textboxes and text areas, Checkboxes and
Week 4	**Forms in HTML II :** Select lists in Forms, combining Forms with images and tables, Introduction to dynamic programming, client side versus server side
Week 5	**Client-Side Programming and Server-Side Programming :** Client-Side Programming and Server-Side Programming, JavaScript, What is JavaScript, What JavaScript can do?, What JavaScript can't do?, The Script Tag, Handling older browsers, JavaScript Statements, Script statement execute, JavaScript data types, Variables, Data type conversion, browser events.
Week 6	**Arithmetic Operators :** Arithmetic operators, Comparison operators, Examples and solutions, **Control Structures (if statement, if-else statement), Loops (for loop), Functions, Function parameters**
Week 7	**Window and Document objects :** Window and Document objects, the window object, creating window, properties and methods: window.status, window.alert, window.confirm, window.prompt
Week 8	**Forms and Form elements :** Forms and Form elements, creating a form, form properties, text object, form object button object, checkbox object, Radio object, Select object,
Week 9	**Midterm Exam**

Week 10	Test 2: functions, forms and dates , Passing form data to functions, Submitting forms, Strings, Math and Date, Examples and solutions. **Images and dynamic HTML : Images and dynamic HTML, the image object, interchanging images, prechaching images, creating image rollover, Examples and solutions.** **The String object (in detail), Examples and solutions**
Week 11	**The events:** The event object, Event handler, Event properties, Window event-handler, layer event handler, mouse event handler, other event handlers
Week 12	**Global functions:** Global functions and statements, eval(), escape(), isNaN(), number(), parsefloat(), parseInt(), string(), unescape(), unwatch(), watch()
Week 13	**Data-Entry : Data-Entry validation, isEmpty(), isNumber(), isInteger(), isPosInterger** **Test 3: Images, Strings, and Global functions String : The String object, Examples and solutions**
Week 14	JS frameworks
Week 15	

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction Xhtml language
Week 2	Lab 2: web page design , opening, saving
Week 3	Lab 3: text, font design implementation
Week 4	Lab 4: color, image, implementation .
Week 5	Lab 5: list, groups, page division
Week 6	Lab 6: forms , linking pages, meta function ,hyperlink
Week 7	Lab 7: publishing and linking page with internet.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**The Complete Internet and World Wide Web Programming Training course** Author : Harry M.Deitel, Paul J. Deitel, Tom Nieto Edition & Year public : Prentice Hall PTR,2000	Yes

Recommended Texts	Java script : the definition Guide, **Author :**David Flanagan, O'Reilly Media **Edition & Year public :** 5th edition , 2006	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/web	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Distributed Computing & Systems**			**Module Delivery**	
Module Type	**E**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4107**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	7	
Administering Department			**College**		
Module Leader	Dr. Mohanad Ahmed		**e-mail**	Mohanad.ahmed1@mtu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Asst Prof. Siraj Qays Mahdi		**e-mail**	Siraj_qays@mtu.edu.iq	
Peer Reviewer Name	Asst. Prof. Alhamzah Taher Mohammed		**e-mail**	alhamza_tm@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To introduce students to the fundamental problems, concepts, and approaches in the design and analysis of distributed computing systems. 2. To familiarize students with the stages of the distributed system design cycle, including system architecture, data and processes arrangements, naming, communication and coordination issues, existing distributed computing paradigms, techniques, and tools, and evaluating the effectiveness of distributed application systems for specific data, task, and user types. 3. understand the evolution of the distributed computing from its early beginnings as multi-processor and multi-computer systems, to computer networks, to the emerging cloud, edge (fog, dew, mist) and heterogeneous computing environments 4. explain and discuss basic principles and typical examples of real-world distributed systems such as NFS file-sharing system and the web. 5. understand process migration or more specifically code migration and its role in achieving scalability of distributed system
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. State, prove and apply Shannon's sampling theorem know the widely used models of communication: Remote Procedure Call (RPC), and Message-Oriented Middleware (MOM). 2. know basic principles of the RPC model and problems with achieving distribution transparency. 3. understand the peculiarities of the high-level message-queuing model of process communication. 4. know how to set up multicast facilities for data dissemination in distributed systems. 5. understand traditional deterministic means of multicasting as well as probabilistic approaches. 6. know the use of Domain Name System (DNS). 7. know the way of using attributes assigned to an entity to resolve a description of an entity in distributed system. 8. know basics of the security management including mechanisms to distribute cryptographic keys, add and remove users from a system, prove ownership to access specified resources, etc...
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.

	Introduction: Design goals Distributed systems consist of autonomous computers that work together to give appearance of a single coherent system. Design goals for distributed systems include sharing resources and ensuring openness. In addition, designers aim at hiding many of the intricacies related to distribution of processes, data and control. [10 hrs] Types of systems Different types of distributed systems exist which can be classified as being oriented towards supporting computations, information processing and pervasiveness. Distributed computing systems are typically deployed for high-performance applications often originating from parallel computing. Cloud computing goes beyond high-performance computing and also supports distributed systems found in traditional office environments. An emerging class of distributed systems is represented by pervasive computing environments, including mobile-computing systems as well as sensor-reach environments. [10 hrs] Architectures: Architectural styles. Middleware We can make a distinction between software architecture and system architecture. AN architectural style reflects the basic principle that is followed in organizing the interaction between the software components comprising a distributed system. Important styles include layering, object-based styles, resource-based styles, and styles in which handling events are prominent. [10 hrs] Communication: Foundations. RPC Communication between processes is essential for any distributed system. In traditional network applications, communication is often based on the low-level message-passing primitives offered by the transport layer. One of the most widely used abstractions is the Remote Procedure Call (RPC), that offers synchronous communication facilities, by which a client is blocked until the server has sent a reply. [10 hrs] Communication: Message-oriented & Multicast communication Message-oriented middleware models generally offer persistent asynchronous communication, and are used where RPCs are not appropriate. An important class of communication protocols in distributed systems is multicasting. [10 hrs] Naming: Names, IDs. Flat naming Names are used to refer to entities. There are three types of names: an address, an identifier, and human-friendly names. Given these types, we make a distinction

	between flat naming, structured naming, and attribute-based naming. Systems for flat naming essentially need to resolve an identifier to the address of its associated entity. This can be done in different ways. [10 hrs] Fault tolerance Fault tolerance is defined as the characteristic by which distributed computing system can mask the occurrence and recovery from failures. Several types of failures exist. Redundancy is the key technique needed to achieve fault tolerance. When applied to processes, the notion of process groups becomes important. The real problem is that members of a process group need to reach consensus in the presence of various failures. Paxos is by now a well-established and highly robust consensus algorithm. [10 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The assessment strategy for this module is designed to provide students with the opportunity to demonstrate the skills and knowledge as described in the learning outcomes. The written examination will assess the knowledge of terminology, concepts and theory of Distributed Computing & Systems, as well as the ability to analyze problems and new features of distributed computing systems to solve and predict effects. The laboratory experiments will evaluate the acquired technical skills and expertise required to apply these methods.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1-3, LO #3-6
	Assignments	2	10% (10)	3, 12	LO #1,2, LO #3-7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 1-7
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Design goals** Distributed systems consist of autonomous computers that work together to give appearance of a single coherent system.
Week 2	**Architectures: System architecture. Example** There are many different organizations of distributed systems. Client-server architectures are often highly centralized.
Week 3	**Processes: Threads. Virtualization** Processes play a fundamental role in distributed systems as they form a basis for communication between different machines.
Week 4	Processes: Clients. Servers.
Week 5	**Communication: Foundations. RPC**
Week 6	**Naming: Structured naming. Attribute-based naming**
Week 7	Mid-term Exam
Week 8	**Coordination: Clock synchronization** There are various ways to synchronize clocks in a distributed system. All methods are based on exchanging clock values, while taking into account the time it takes to send and receive messages.
Week 9	**Midterm Exam**
Week 10	**Coordination: Mutual exclusion. Election algorithms** An important class of synchronization algorithms is that of distributed mutual exclusion. These algorithms ensure that in a distributed collection of processes, at most one process at a time has access to a shared resource. Consistency and replication: Data-centric & Client-centric models

Week 11	Consistency and replication: Replica management. Consistency protocols
Week 12	Fault tolerance.
Week 13	Security
Week 14	**Distributed System Models and Enabling Technologies**
Week 15	**Parallel Programming Systems and Models**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Distributed Systems. (Build a Cluster)
Week 2	Lab 2: Distributed System Models and Enabling Technologies. (Benchmarking)
Week 3	Lab 3: Parallel Programming Systems and Models. (Map Reduce)
Week 4	Lab 4: Cloud Computing.
Week 5	Lab 5: File systems & Networked file systems.
Week 6	Lab 6: Optimizing Large Data Transfers over 100Gbps Wide Area Networks - Anupam Rajendran.
Week 7	Lab 7: Distributed Filesystems.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms, (Pearson Education).	No
Recommended Texts	George Coulouris, Jean Dollimore. Tim Kindberg: Distributed Systems concepts and design.	No
Websites	https://www.youtube.com/watch?v=cQP8WApzIQQ&list=PLrw6a1wE39_tb2fErI4-WkMbsvGQk9_UB&ab_channel=MIT6.824%3ADistributedSystems	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group	**A -** Excellent	امتياز	90 - 100	Outstanding Performance

(50 - 100)	**B -** Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Professional Ethics**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MTU1008**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	CET		**College**	EETC	
Module Leader	Hussam fahmi aajami		**e-mail**	hussam_fahmi@mtu.edu.iq	
Module Leader's Acad. Title	Asst. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Abdulah Abdulrazak		**e-mail**	abdallaabdalrazak@mtu.edu.iq	
Peer Reviewer Name	Dr. Osama Abbas Hussein		**e-mail**	osama.abbas@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The module aims to: 1. To develop an understanding of the fundamental concepts and principles of engineering ethics. 2. To explore ethical theories and frameworks relevant to engineering practice and decision-making. 3. To familiarize students with codes of ethics and professional conduct in the engineering field. 4. To cultivate ethical decision-making skills and the ability to analyze and resolve ethical dilemmas in engineering. 5. To promote awareness of social, environmental, and global dimensions of engineering ethics and their impact on professional practice.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should be able to: 1. Demonstrate a comprehensive understanding of the principles and importance of engineering ethics in professional practice. 2. Apply ethical theories, frameworks, and decision-making models to analyze and resolve ethical dilemmas in engineering. 3. Evaluate the social, environmental, and global impact of engineering decisions and recognize the ethical responsibilities of engineers in these contexts. 4. Comprehend the professional obligations and responsibilities of engineers, including codes of ethics and professional conduct. 5. Reflect on personal ethical development, demonstrate ethical awareness, and engage in lifelong learning in the field of engineering ethics.
Indicative Contents المحتويات الإرشادية	1. Introduction to Engineering Ethics: [18 hrs.] • Definition and importance of engineering ethics. • Ethical theories and frameworks in engineering. • Codes of ethics and professional conduct. 2. Ethical Decision-Making: [18 hrs.] • Steps in ethical decision-making. • Utilitarianism and consequentialist ethics. • Deontological ethics and duty-based approaches. 3. Professional Responsibility and Accountability: [18 hrs.] • Professionalism and professional identity. • Professional obligations and responsibilities. • Ethical and legal aspects of professional practice. 4. Social and Environmental Impact of Engineering: [18 hrs.] • Engineering and sustainability. • Environmental ethics and considerations. • Social responsibility and stakeholder engagement. 5. Ethical Issues in Research and Innovation: [18 hrs.] • Research integrity and responsible conduct of research. • Intellectual property rights and plagiarism. • Ethical considerations in technological innovation.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategies for the module on Computer Principles and operating systems can include: 1. Lectures and Presentations: The instructor delivers lectures and

	presentations to provide theoretical knowledge and concepts related to engineering ethics. This helps students understand the fundamental principles and frameworks. 2. Case Studies and Discussions: Engaging students in analyzing real-world case studies allows them to apply ethical theories and decision-making models to practical situations. Discussions and group activities encourage critical thinking and ethical reasoning. 3. Ethical Dilemma Analysis: Presenting students with ethical dilemmas specific to engineering contexts enables them to identify and evaluate conflicting values and potential courses of action. This fosters ethical decision-making skills and ethical awareness. 4. Guest Speakers and Expert Sessions: Inviting guest speakers, such as experienced professionals or ethics experts, to share their insights and experiences enriches the learning process. These sessions provide practical perspectives and real-world examples. 5. Group Projects and Presentations: Assigning group projects related to engineering ethics encourages collaboration, research, and application of ethical principles. Students can explore specific topics, develop solutions, and present their findings, fostering critical thinking and communication skills. 6. Ethics Workshops and Debates: Organizing workshops and debates focused on ethical topics in engineering allows students to actively engage in discussions, explore different viewpoints, and develop their argumentation skills. 7. Ethical Reflection and Self-Assessment: Providing opportunities for students to reflect on their personal values, ethical beliefs, and professional aspirations promotes self-awareness and encourages students to align their actions with ethical principles. 8. Online Resources and Learning Platforms: Utilizing online resources, such as interactive modules, online discussions, and ethical case repositories, enhances accessibility to additional learning materials and facilitates self-paced learning. 9. Assessment Methods: Assessing students through assignments, quizzes, exams, and presentations ensures their understanding of ethical theories, decision-making models, and their ability to apply them in practical scenarios. 10. Field Visits and Industry Engagements: Organizing visits to engineering organizations or engaging with industry professionals allows students to observe ethical practices in real-world settings and understand the challenges and responsibilities faced by engineers.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, and 3,4
	Assignments	2	20% (10)	2, 12	LO # 1,2 and 3,4
	Projects / Lab.				
	Report	1	10% (10)	14	All
Summative assessment	**Midterm Exam**	2 hours	10% (10)	8	LO # 1-4
	Final Exam	3 hours	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Engineering Ethics • Definition and importance of engineering ethics. • Ethical theories and frameworks in engineering. • Codes of ethics and professional conduct.
Week 2	Ethical Decision-Making Models • Steps in ethical decision-making. • Utilitarianism and consequentialist ethics. • Deontological ethics and duty-based approaches.
Week 3	Professional Responsibility and Accountability • Professionalism and professional identity. • Professional obligations and responsibilities. • Ethical and legal aspects of professional practice.
Week 4	Social and Environmental Impact of Engineering • Engineering and sustainability. • Environmental ethics and considerations. • Social responsibility and stakeholder engagement.
Week 5	Conflicts of Interest and Ethical Dilemmas

	• Identification and resolution of conflicts of interest. • Ethical dilemmas in engineering practice. • Balancing competing ethical considerations.
Week 6	Ethical Issues in Research and Innovation • Research integrity and responsible conduct of research. • Intellectual property rights and plagiarism. • Ethical considerations in technological innovation.
Week 7	Engineering and Public Safety • Risk assessment and management in engineering. • Safety standards and regulations. • Whistleblowing and professional accountability.
Week 8	• **Midterm Exam**
Week 9	Ethical Leadership and Professional Integrity • Ethical leadership in engineering organizations. • Integrity and ethical behavior in the workplace. Ethical implications of professional relationships. Global and Cultural Perspectives in Engineering Ethics • Cultural relativism and ethical relativism. • Cross-cultural communication and ethical challenges. • Global engineering ethics and international standards.
Week 10	Ethical Issues in Emerging Technologies • Ethical considerations in artificial intelligence. • Biomedical ethics and emerging medical technologies. • Ethical challenges in nanotechnology and genetic engineering.
Week 11	Ethical Responsibilities to Clients and Customers • Professional obligations to clients and customers. • Confidentiality and privacy in engineering practice. • Fair competition and avoiding conflicts of interest.
Week 12	Ethical Responsibilities to Colleagues and Society • Respect for colleagues and teamwork ethics. • Ethical implications of social media and online interactions. • Public engagement and outreach in engineering.
Week 13	Ethical Issues in Engineering Management • Ethical challenges in project management. • Ethical responsibilities of engineering managers. • Corporate social responsibility and ethical business practices.
Week 14	Professional Development and Ethical Awareness • Lifelong learning and ethical competence. • Continuing education and professional ethics. • Ethical challenges in a rapidly changing technological landscape.
Week 15	Case Studies and Ethical Reflection • Analysis of real-world engineering ethics case studies. • Ethical reflection and self-assessment. • Final project or examination on engineering ethics principles and applications.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	C. E. C. E. Harris Jr., M. S. Pritchard, and M. J. Rabins, "Engineering Ethics: Concepts and Cases," Cengage Learning, 2018. [Online]. Available: ISBN: 978-1305500846.	Yes
Recommended Texts	M. W. Martin and R. Schinzinger, "Ethics in Engineering," McGraw-Hill Education, 2016. [Online]. Available: ISBN: 978-0078112481.	No
Websites	The Collage E-Library	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Fiber Optics Communication**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4201**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader	Omar Nameer M. Salim		**e-mail**	omarnmsalim@mtu.edu.iq	
Module Leader's Acad. Title	Assoc. Professor.		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Asst. Prof. Alhamzah taher		**e-mail**	alhamza_tm@yahoo.com	
Peer Reviewer Name	Dr. Osama Abbas Hussein		**e-mail**	osama.abbas@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. In this course, the students can acquire the basic knowledge of Optical Communication Systems 2. Optical Communication Media 3. Fiber optics communication principles and their application. 4. Students will be learned about high-speed single-mode and low-speed multimode fiber, 5. Students can acquire knowledge of step and graded refractive index profiles, different dispersion mechanisms and their effect on high-speed links, 6. The advantage of coherent (LASER) light sources over incoherent (LED) sources for the long haul, high-speed links, and photodetectors.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Discuss Laser Principles , operation , structures , applications 2. Describe Photodiodes 3. Explain the Optical Communication Media 4. Identify optical fiber waveguides 5. Explain the of optical fiber communication 6. Describe Transmission characteristics of optical fibers 7. Discuss Optical Transmitters - transmitter types , design 8. Explain Optical Amplifiers
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Basic Concepts of Optical Communication Systems (6 hr) Light Emitting Diodes (6 hr) Photodiodes (6 hr) Optical Communication Media (12 hr) Transmission characteristics of optical fibers (12 hr) Optical Fiber waveguides, couplers and connectors (12hr) Optical Transmitters (8 hr) Optical receivers (8 hr) Optical Amplifiers (4 hr)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Skills competency is important as theory knowledge, especially in vocational and technical education. Thus, the aim of this module is to develop the students conceptual knowledge and skills in optical fiber communication to equip the students with the necessary skills to become competent and skillful Technologists. lecture and seminars will be used to explain the theory and principles of the module. Also, laboratory reports and mini-projects will be used. Quantitative instruments such as pre-test and post-test will be used to check students' conceptual knowledge of electrical measurement after the theory lecture or laboratories work. Video will be used to explain the electrical measurement instruments. Observation form and laboratory rubric will be used to analyze the skills of the students. The observer comments from the laboratory staff on student skills will be classified according to thematic analysis to evaluate students learned skills.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (5)	3, 9	LO #1, 2,LO#3-6
	Assignments	2	10% (5)	5, 13	LO #1- 3,LO#3-7
	Project / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 1-7
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Basic Concepts of Optical Communication Systems
Week 2	Light Behavior
Week 3	Laser Principles
Week 4	Light Emitting Diodes (LEDs) - principle of operation , structures , applications
Week 5	Laser Diodes LDs- principle of operation , structures , applications
Week 6	Photodiodes - (pin Photodiode , Avalanche Photodiode , comparisons of photodetectors
Week 7	**Mid-term Exam**
Week 8	Optical Communication Media- Overview of optical communication media, free space optical communication, optical fiber waveguides.
Week 9	Overview of optical fiber communication- general system, advantages, disadvantages, and applications of optical fiber communication
Week 10	optical fiber waveguides, Ray theory, cylindrical fiber, single mode fiber, multi-mode fiber, cutoff wavelength, mode filed diameter
Week 11	Transmission characteristics of optical fibers- Attenuation, absorption, scattering losses, bending loss, dispersion
Week 12	Fiber couplers and connectors
Week 13	Optical Transmitters - transmitter types , design
Week 14	Optical Receivers - receivers types , design
Week 15	Optical Amplifiers

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Fiber Optics
Week 2	Lab 2: Fiber Cleaving
Week 3	Lab 3: Numerical Aperture of a Fiber
Week 4	Lab 4: Coupling into Fiber
Week 5	Lab 5: Profile of Fundamental Mode
Week 6	Lab 6: High-Order Modes in Fiber
Week 7	Lab 7: **Mid-term Exam**
Week 8	Lab 8: Coupling and Propagation Loss - i
Week 9	Lab 9: Coupling and Propagation Loss - ii

Week 10	Lab 10: Analog Communication Link - i
Week 11	Lab 11: Analog Communication Link – ii
Week 12	Lab 12: Digital Communication Link - i
Week 13	Lab 13: Digital Communication Link - ii
Week 14	Lab 14: A preparatory week before the Final Exam
Week 15	Lab 15: **Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Optical Communications Essentials, Gerd Keiser, The McGraw-Hill Companies.** **Optical Fiber Communication – Gerd Keiser, 4th Ed., MGH, 2008.**	Yes
Recommended Texts	**Handbook of Laser Technology and Applications , Colin E. Webb, Julian D. C. Jones** **CRC Press**	No
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Advanced Computer Technology**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4202**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader	Dalal Abdulmohsin Hammood		**e-mail**	dalal.Hammood@mtu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Prof. Dr. Mahmood Farhan Mosleh		**e-mail**	drmahmood@mtu.edu.iq	
Peer Reviewer Name	Dr. Mahmoud Shuker Mahmoud		**e-mail**	mahmoud.shukur@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The course aims to provide students information about : 1. The µP and its architecture and the addressing modes 2. Paging mechanism, Segment translation and Page translation 3 Cache memory, Cache organization, fully associative, Direct mapped and Set associative 4. Cache memory used for 80386 - Direct Maps - Two-way set associative 5. Intel's Pentium and its Features 6. Pentium pro, Out of order execution 7. other Pentium processors, Core processor
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- an ability to apply knowledge of microprocessor Architecture. (High) 2- an ability to apply knowledge about 80386 The µP (High) 3- an ability to apply knowledge about Paging mechanism, Segment translation and Page translation (High) 4- an ability to identify and calculate the addressing mode and physical address (High) 5- an ability to calculate the data and tag for cache (High)
Indicative Contents المحتويات الإرشادية	**-Introduction to the Microprocessor and Computer (5 hr)** **-The µP 80386 architecture (14 hr)** **-Protected mode memory addressing (10hr)** **-Descriptor and page table entries(10 hr)** **-Memory paging(10 hr)** **-Paging mechanism(5 hr)** **-A translation lookaside buffer (TLB) (10hr)** **-Cache memory(10 hr)** **-Intel's Pentium(5 hr)**

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب موزع على (15) اسبوع

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1,2, LO#3,4
	Assignments	2	10% (10)	2, 12	LO #1,2, LO#3,4
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 1-4
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-3
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to the Microprocessor and Computer**
Week 2	**The μ_p 80x86 and its architecture** **Internal organization of μ_p 80x86**

Week 3-4	**The μP 80386 architecture** • **Addressing mode** • **Assembly language** **Memory segmentation**
Week 5-6	**Protected mode memory addressing** • **Selectors and descriptors** • **Local and global descriptors tables**
Week 7	**Descriptor and page table entries** • **Program-invisible registers** • **Illustrating local memory access.** **Examples**
Week 8	**Midterm Exam**
Week 9	**Memory paging** **Virtual memory**
Week 10	**Paging mechanism** • **Segment translation** • **Page translation**
Week 11	**A translation lookaside buffer (TLB)** **Examples**
Week 12	**Major changes in the 80386 μ_p**
Week 13	**Cache memory** • **Cache organization** • **Fully associative** • **Direct mapped** **Set associative**
Week 14	**Cache memory used for 80386** • **Direct Maps** • **Two-way set associative**
Week 15	**Intel's Pentium** • **Features of the Pentium** **Intel's overdrive technology**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Week 1	Lab 1: Introduction to Mp 80386
Week 2	Lab 2: programming using assembly language
Week 3	Lab 3: programming many functions
Week 4	Lab 4: programming many functions using Assembly Language
Week 5	Lab 5: Examples
Week 6	Lab 6: Examples
Week 7	Lab 7: Examples

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	The 80x86 IBM Pc and compatible computer	Yes
Recommended Texts		No
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Network Security & Cybersecurity**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4203**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader	Dr. Mohammed Joudah		**e-mail**	mjzaiter@mtu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Asst. Prof. Omar Nameer Mohammed Salim		**e-mail**	Omar Nameer Mohammed Salim	
Peer Reviewer Name	Dr. Mahmoud Shuker Mahmoud		**e-mail**	mahmoud.shukur@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Upon completion of this course you will have acquired the following knowledge: 1. Understand hacking techniques. 2. Understand the fundamentals of secure network design. 3. Understand the issues involved with providing secure networks. 4. Understand underlying cryptography required for secure communications, authorization and 5. authorization. 6. Obtain hands on experience in cryptography and network security through laboratory work
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will be able to explain security principles. 2. Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks. 3. Understand Various Encryption mechanisms for secure transmission of data and management of key required for required for encryption. 4. Students will be able to evaluate risks faced by computer systems and how various attacks work. 5. Students will be able to explain how various security mechanisms work, and correlate these security mechanisms with security principles. 6. Students will be able to compare various security mechanisms and articulate their advantages and limitations. 7. Understand authentication requirements and study various authentication mechanisms. 8. Understand network security concepts and study different Web security mechanisms. 9. Students will be able to create cybersecurity policies and procedures to help 10. secure a medium-sized organization's information technology infrastructure. 11. Students will understand the latest techniques hackers employ to test out cyber defenses. 12. Students will analyze the mission and strategy of the Iraq government agencies who protect our portion of the Internet. 13. Students will discuss hypothetical issues of cyber security with other students in the group Discussions format.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Security Concepts Overview Difference types of attacks; the reasons for protecting the personal information and commercially sensitive information; the types of encryptions; the advantages and limitations of encryption such as symmetric key and asymmetric key. [15 hrs]

	Security for Malware and Wearable Devices Definition and function of malware; types of malware; mobile malware; app security; Android/iOS security model; how anti-virus software works and its limitations. [15hrs] Network Security Difference types of network; the function and limitations of a firewall; Different types of wireless security (i.e. WEP and WPA2); access control. [15 hrs] Web Security Digital certificate; one-time password; appropriate settings of cookies; protect private data in browsers; types of content-control software. [15 hrs] Communications Encrypting and decrypting an e-mail; digital signature; unsolicited e-mail; phishing; backdoor access in instant messaging. [15 hrs] Secure Data Management Physical security; backup procedures; data destruction utilities. [14 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1-4,LO# 4-8
	Assignments	2	10% (10)	3, 12	LO #1,2,LO# 3-7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 1-11
Summative assessment	Midterm Exam	2 hr	10% (10)	6	LO # 1-4
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, Symmetric Ciphers model: plaintext, encryption algorithm, secret key, cipher text, decryption algorithm.
Week 2	Model of Conventional Encryption and Cryptography Classification.
Week 3	Affine Cipher and Polyalphabetic algorithm (Vigenere cipher).
Week 4	Cryptanalysis of a Symmetric key.
Week 5	Hill cipher and Play fair cipher. Stream Cipher
Week 6	Mid-term Exam
Week 7	Unit-Step Forcing, Forced Response, the RLC Circuit
Week 8	DES—The Data Encryption Standard, hers -16 round.
Week 9	Public-Key Algorithms, - RSA.
Week 10	Diffie Hellman Algorithm.
Week 11	Elgamal Algorithm.
Week 12	Cyber Security Tools
Week 13	Web Security.
Week 14	Email Security.
Week 15	PGP—Pretty Good Privacy and S/MIME.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts: a) Caesar Cipher b) Playfair Cipher
Week 2	Lab 2: Implement the following algorithm : a) Hill Cipher b) Vigenere Cipher
Week 3	Lab 3: Implement the RSA Algorithm.
Week 4	Lab 4: Implement the DES Algorithm.
Week 5	Lab 5: Implement the Hash function SHA-1 Algorithm.
Week 6	Lab 6: Implement the SIGNATURE SCHEME - Digital Signature Standard.
Week 7	Lab 7: Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Stallings, W. (2016). Cryptography and network security: principles and practice (Eighth edition.). Pearson	No
Recommended Texts	Speciner, M. et al. (2002). Network security: Private communication in a public world. (Second edition.).	No
Websites	https://www.youtube.com/watch?v=0UMeUB1PIRo&list=RDCMUCu1lQtQ7SJU27bRIL6hzr9A&start_radio=1&rv=0UMeUB1PIRo&t=8	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Cloud Computing**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4204**				
ECTS Credits	5				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader	Osama Abbas Hussein		**e-mail**	Osama.abbas@mtu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor	Ali Nafaa Gaafar		**e-mail**	ali_nafaa@mtu.edu.iq	
Peer Reviewer Name	Asst. Prof. Alhamzah Taher Mohammed		**e-mail**	alhamza_tm@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To define the concept of hosting 2. To introduce the cloud-computing paradigm 3. To simplify the transition from bare-metal servers thinking to a cloud-native approach. 4. To foster the automation and orchestration concepts. 5. To design, build and manage private clouds.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Classify cloud hosting types. 2. Describe the data center infrastructure. 3. Utilization of virtual machines 4. Transition into virtual networking. 5. Management of cloud infrastructure. 6. Comprehension of cloud-storage 7. Correct utilization of micro-services. 8. Proper use of rate-limiting concepts. 9. Understanding the concept of security. 10. Understanding the concept of privacy. 11. Capability to diagnose bottlenecks in cloud-based systems. 12. Proper application of concepts of elasticity in production systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: -**Cloud Computing History** – Power wall, Cloud Computing physical component and organization, cloud computing services. [5 hr.s] **-Cloud Computing types** – Private and Public Cloud, Hybrid and Multi-Cloud, Hyperscale's, and Cloud server selection. [5 hr.s] **-Data Centers** – Racks, aisles, Pods, Cloud networking and power management, North-South and East-West Networks, Fat Tree design, leaf-spine scaling. [5 hr.s] **-VM and Containers** – Virtualization, Hypervisor, Container and Docker software components. [5 hr.s] **-Virtual Network and Virtual Storage** – Overlays and Underlays, VLANs and VXLANs, SDN and OpenFlow Protocol, Programmable Network. [10 hrs.] **-consensus** – Need of agreement in cloud-based systems, types, challenges. [10 hrs.] **-Cloud-storage**– traditional vs sottware designed storage. [5 hr.s]

	-Microservices- Monolithic Apps in Data Centers, The Microservices Approach: Pros and Cons, Microservices Granularity, Communication Protocols for Microservices, Service Mesh Proxy, Microservices Technologies. [5 hr.s] **-Serverless Computing** – The serverless Computing Approach, Stateless Servers and Containers, Serverless Infrastructure, an Example of Serverless Processing. [10 hr.s] **-Edge Computing and IoT -** The Latency Disadvantage of Cloud, Low Latency Needs, Extending Edge to A Fog Hierarchy, Multi-level Caching, Edge computing and IIoT, Communication of IIoT, Decentralization. [10 hr.s]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	6, 12	LO #1-3, LO #3-8
	Assignments	2	10% (10)	8, 13	LO # 1-5, LO#5-10
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	14	LO # 1-11
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-6
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**The Era of Cloud Computing:** The Motivations for Cloud, Power wall, Racks of Server Computer, Elastic Computing, Multi-tenant Clouds, IaaS, PaaS, SaaS, and DaaS.
Week 2	**Types of Clouds and its Providers:** Private and Public Cloud, Provider Lock-in, Hybrid Cloud, Multi-Cloud, Hyperscale.
Week 3	**Data Center Infrastructure and Equipment:** Racks, Aisles, and Pods, Power and Cooling, Network Equipment, North-South and East-West Network Traffic, Fat tree Design, leaf spine scaling, Unified Data Centers Network.
Week 4	**Virtual Machines and Containers:** Approaches To virtualization, Properties of Virtualization, Level of Trust and I/O devices, VM Migration, Hypervisor. Container approach, Docker Containers, Docker software components.
Week 5	**Virtual Networks and Virtual Storage:** Virtual Networks, Overlay and Underlays, VLANs, VXLAN, Virtual Network Switch, NAT, Mobility, SDN, The OpenFlow Protocol, Programmable Networks. Local and Remote Storage, NAS, SAN, Object Storage.
Week 6	**Consensus:** Raft, Paxos, consistency levels, CAP, theorem.
Week 7	**Software :** Cloud native vs. Conventional Software, Parallel Processing, MapReduce Programming Paradigm, Math of MapReduce, Apache Hadoop, HDFS, Hadoop support for Programming languages.
Week 8	**Microservices:** Monolithic Apps in Data Centers, The Microservices Approach: Pros and Cons, Microservices Granularity, Communication Protocols for Microservices, Servie Mesh Proxy, Microservices Technologies.
Week 9	Mid-term-1
Week 10	**Cloud Storage:** File, Object, Database storage systems, Software Defined Storage
Week 11	**Serverless Computing and DevOps:** The serverless Computing Approach, Stateless Servers and Containers, Serverless Infrastructure, An Example of Serversles Processing. DevOps Approach, Continuous Integration, Continuous Delivery, Caucious Deployment, Sandbox, Canary, and Blue/Green.

Week 12	**Edge Computing and IoT:** The Latency Disadvantage of Cloud, Low Latency Needs, Extending Edge to A Fog Hierarchy, Multi-level Caching, Edge computing and IIoT, Communication of IIoT, Decentralization.
Week 13	**Cloud Security and Privacy:** Cloud Security Problems, Traditional Security Methods and its insufficiency with cloud, Zero Trust Security Model, Identity Management, PAM, AI and Security, Protecting Remote Access, Privacy in Cloud, Back Doors, Side Channels.
Week 14	**Building Your Own Cloud**: Case Study, see TextBook#2
Week 15	**Building Your Own SaaS:** Case Study, see TextBook#2

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: hosting providers portal mgmt.
Week 2	Lab 2: hosting specs and pricing
Week 3	Lab 3: virtualization software (installation, config)
Week 4	Lab 4-5: VM mgmt.
Week 5	
Week 6	Lab 6: backup, recovery, scaling, up down.
Week 7	Lab 7-8: Proxmox mgmt
Week 8	
Week 9	Lab 9: migration offline, online, hypervisor replacement
Week 10	Lab 10-11-12: docker mgmt
Week 11	
Week 12	
Week 13	Mgmt. tools
Week 14 & 15	Virtual appliances

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Textbooks** **Book#1: Douglas E. Comer, The Cloud Computing Book, The future of Computing Explained, 1st Edition, CRC Press, 2021.** **Book#2: Ian Foster and Dennis B. Gannon, "Cloud Computing for Science and Engineering", The MIT Press, 2017.**	Yes
Recommended Texts		No

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**project**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**CET4205**				
ECTS Credits	5				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	Dr. Osama Abbas Hussein		**e-mail**	Osama.abbas@mtu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam	2 hr	40% (10)	8	
	Final Exam	2hr	60% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14 & 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**

Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Reconfigurable Computing Systems**			**Module Delivery**	
Module Type	**Elective**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4206**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader	Dr. Mohanad Ahmed Mezher		**e-mail**	mohanad.ahmed1@mtu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	M.Sc	
Module Tutor	Siraj Qays Mahdi		**e-mail**	Siraj_qays@mtu.edu.iq	
Peer Reviewer Name	Dr. Osama Abbas Hussein		**e-mail**	osama.abbas@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understand the fundamentals of the reconfigurable computing and reconfigurable architectures 2. Articulate the design issues involved in reconfigurable computing systems with a specific focus on Field Programmable Gate Arrays (FPGAs) both in theoretical and application levels 3. Understand the performance trade-offs involved in designing a reconfigurable computing platform with a specific focus on the architecture of a configurable logic block and the programmable interconnect 4. Discuss the state-of-the-art reconfigurable computing architectures spanning fine grained (look up table-based processing elements) to coarse grained (arithmetic logic unit level processing elements) architectures. 5. Understand both how to architect reconfigurable systems and how to utilize them for solving challenging computational problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. an ability to apply knowledge of mathematics, science, and engineering (High) 2. an ability to design and conduct experiments, as well as to analyze and interpret data (High) 3. an ability to design a system, component, or process to meet desired needs within realistic constraints (High) 4. an ability to identify, formulate, and solve engineering problems (High) 5. an ability to communicate effectively (Medium) 6. a recognition of the need for, and an ability to engage in life-long learning (Medium) 7. a knowledge of contemporary issues (High) 8. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. (High)
Indicative Contents المحتويات الإرشادية	--Introduction to Reconfigurable Computing (5 hr) --FPGA Architectures(10 hr) --FPGA Design Cycle (20 hr) --Coarse-grained Reconfigurable Devices (10 hr) --Reconfigurable Computing Applications (7 hr) --Multi-FPGA Systems (5 hr) --FPGAs vs. Multicore architectures (5 hr) --Advanced Topics (12 hr)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1-3, LO#3-5
	Assignments	2	10% (10)	2, 12	LO #1-2, LO#3-6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 1-7
Summative assessment	**Midterm Exam**	2 hr	10% (10)	9	LO # 1-5
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Reconfigurable Computing
Week 2-3	FPGA Architectures
Week 4-7	FPGA Design Cycle • Technology-independent optimization • Technology Mapping • Placement • Routing
Week 8	Coarse-grained Reconfigurable Devices
Week 9	**Midterm Exam**
Week 11	Reconfigurable Computing Applications
Week 12	Multi-FPGA Systems
Week 13	FPGAs vs. Multicore architectures
Week 14-15	Advanced Topics: • Dynamic Reconfiguration • Partial Reconfiguration • 3D FPGAs

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to ISE design suite software
Week 2	Lab 2: VHDL programming tools
Week 3	Lab 3: programming simple VHDL program
Week 4	Lab 4: IF statements -VHDL programs
Week 5	Lab 5: For loop -VHDL programs
Week 6	Lab 6: UP-Down counters
Week 7	Lab 7: Multi functions programs

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	: (Optional) Reconfigurable Computing: The Theory and Practice of FPGA-Based Computation by Scott Hauck, André DeHon.	Yes
Recommended Texts	C. Maxfield, The Design Warrior's Guide to FPGAs, Newnes, 2004, ISBN: 978-0750676045	No
Websites	http://class.ece.iastate.edu/cpre583/	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Wireless Sensor Network**			**Module Delivery**	
Module Type	**Elective**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4207**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader	Mahmood Farhan Mosleh		**e-mail**	drmahmoodfarhan@gmail.com	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Aseel Hameed Majeed		**e-mail**	aseel_Alnakkash@mtu.edu.iq	
Peer Reviewer Name	Asst. Prof. Alhamzah Taher Mohammed		**e-mail**	alhamza_tm@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim of the course is to provide students with knowledge and skills for wireless network design, operation and testing, equipment configuration, security considerations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the course, students will know: 1- Electromagnetic signal specifications IEEE802.11 link layer protocol data rates, media access control and logical link control techniques, quality-of-service and security features 2- Wireless network design principles. 3- Perform wireless signal planning and strength measurement. 4- Design wireless network with optimal performance. 5- Plugin and configure wireless network equipment. 6- Build large wireless network with centralized control. 7- Configure wireless network security 8- The necessary skills to design, configure and operate production-grade wireless network.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Introduction Introduction to WSNs, Wireless technology history, modern wireless networks, Advantages, Challenge vs Ad-hoc network. [25 hrs] Part B – Architecture Network architecture, node architecture, types of networks based on its topology, data transfer on media. [25 hrs] Part C – Wi-Fi Protocols IEEE 802.11 (Wi-Fi) protocol design. Wi-Fi physical layer, Wi-Fi data-link layer, Wi-Fi logical link control layer, Wi-Fi quality-of-service (QoS) features, Wi-Fi security features [25 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module

	is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	4, 12	LO #1-3, LO#3-7
	Assignments	2	10% (10)	5, 12	LO #1-3, LO#4-7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 1-8
Summative assessment	**Midterm Exam**	2 hr	10% (10)	9	LO # 1-4
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1- 2	Course introduction, wireless network introduction. Wireless technology history, modern wireless networks
Week 3-4	Data transfer over wireless media. Electromagnetic waves propagation. Wireless equipment and EM waves specifications. Data modulation and coding schemes, data decoding.
Week 5-6	IEEE 802.11 (Wi-Fi) protocol design. Wi-Fi physical layer: EM signal specifications, data rates, data modulation and coding schemes.
Week 7-8	Wi-Fi data-link layer: data frame structure, media access control, wireless nodes addressing, error detection/correction.
Week 9	**Midterm Exam**
Week 10	Wi-Fi logical link control layer: data frame types, control and management frames, multiple network coexistence. Wireless network with multiple access points, roaming.
Week 11-12	Wi-Fi logical link control layer: data frame types, control and management frames, multiple network coexistence. Wireless network with multiple access points, roaming.
Week 13	Wi-Fi security features. 802.1x protocol, WPA/2/3 operation. Network infrastructure security.
Week 14	Wi-Fi centralized architecture. Wireless controller configuration/operation
Week 15	Decentralized Wi-Fi networks (Ad-Hoc, Mesh-type). Introduction to sensor networks. Bluetooth basics

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Node construction.
Week 2	Lab 2: WSNs Topologies.
Week 3	Lab 3: IEEE 802.11 design.
Week 4	Lab 4: Wi-Fi logical link.
Week 5	Lab 5: Wi-Fi quality-of-service measurements.
Week 6	Lab 6: WSNs based on 802.1x protocol.
Week 7	Lab 7: Configuring peer-to-peer network (Wi-Fi Ad-Hoc mode or Bluetooth).

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Wireless Sensor Network, Leonidas J. Guibas, The Morgan Kaufmann Series in Networking, Elsevier, NEW YORK	Yes
Recommended Texts	Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.	No
Websites	https://kanchiuniv.ac.in/coursematerials/ECE_COURSE_MATERIAL_ODD%20SEMESTER/ECE_COURSE%20MATERIAL_ODD%20SEMESTER/Dr.S.Omkumar_Wireless%20Sensor%20Networks.pdf	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Optimization Algorithms**			**Module Delivery**	
Module Type	**Elective**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CET4208**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	CET		**College**	EETC	
Module Leader	Ammar Hussein Mutlag		**e-mail**	ammar_alqiesy@mtu.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Asst. Prof. Siraj Qays Mahdi		**e-mail**	Siraj_qays@mtu.edu.iq	
Peer Reviewer Name	Dr. Mahmoud Shuker Mahmoud		**e-mail**	mahmoud.shukur@mtu.edu.iq	
Scientific Committee Approval Date	29/10/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1- Provides students with an introduction to optimization techniques and genetic algorithms. 2- Students will learn about various optimization problems, including linear and nonlinear optimization. 3- Explore the principles and applications of genetic algorithms. 4- Cover the fundamental concepts, algorithmic implementations, and practical considerations for solving optimization problems using genetic algorithms. 5- Students will gain hands-on experience through programming assignments and project work.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the fundamental concepts and principles of optimization techniques. 2- Explain the different types of optimization problems, including linear programming, nonlinear programming, and combinatorial optimization. 3- Evolutionary Algorithms, Swarm Intelligence Algorithms. 4- Understand the principles and workings of genetic algorithms. 5- Advantages and disadvantages of Genetic algorithms. 6- Population, selection, crossover, and mutation algorithms 7- Design and implement genetic algorithms to solve optimization problems. 8- Analyze and compare the performance of different optimization algorithms. 9- Evaluate and select suitable optimization algorithms for specific problem domains. 10- Implement optimization algorithms using programming languages and libraries commonly used in the field. 11- Analyze and interpret the results obtained from optimization algorithms. 12- Apply optimization techniques to real-world applications in various domains.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Introduction to Optimization [5 hrs] Optimization problems and their classifications; Linear programming and integer programming; Nonlinear Optimization. 2- Evolutionary Computation [5 hrs] Introduction to evolutionary computation; Swarm Intelligence Algorithms; Principles of genetic algorithms, advantages, and disadvantages. 3- Genetic Algorithm Components [5 hrs] Representation and encoding of solutions; Selection, crossover, and mutation operators. 4- Genetic Algorithm Operators and Strategies [25 hrs] Tournament selection, roulette wheel selection, and rank-based selection; Single-point crossover, uniform crossover, and arithmetic crossover; Mutation techniques and their impact on exploration and exploitation 5- Genetic Algorithm Variants and Extensions [10 hrs]

	Elitism and population size selection; Adaptive and dynamic parameter settings 6- Applications of Optimization and Genetic Algorithms [10 hrs] Optimization in engineering, operations research, and finance; Applications in scheduling, routing, and resource allocation; Real-world case studies and examples
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
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Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 14	LO #1-3 and 4-9
	Assessment	2	10% (10)	4, 10	LO #1-3 and 4-8
	Projects / Lab.	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	9	LO # 1-7
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to optimization algorithms
Week 2,3	Nature-inspired Optimization Techniques
Week 4,5	Evolutionary Algorithms, Swarm Intelligence Algorithms
Week 6	Introduction to Genetic Algorithm
Week 7	Advantages and disadvantages of Genetic algorithms
Week 8	Type of operators, population, selection, crossover, crossover rate, mutation, mutation rate
Week 9	Mid Term Exam
Week 10,11	Population, selection, crossover, and mutation algorithms
Week 12,13	Applications of genetic algorithms
Week 14,15	Introduction to Particle swarm optimization (PSO)

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to MATLAB: m file
Week 2	Benchmark functions
Week 3	The initial population of the genetic algorithm
Week 4	candidate solutions based on dimension and population
Week 5	Population Movement
Week 6	Genetic algorithm implementation
Week 7	The real application of the genetic algorithm

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Introduction to Genetic Algorithms" by Melanie Mitchell.	No
Recommended Texts	"Introduction to the Theory of Optimization" by J.E. Dennis Jr. and Robert B. Schnabel.	No
Websites	https://www.coursera.org	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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