المرحلة: **الثالثة**

الفصل الدراسي: **الخامس**

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information</td></tr>
<tr><td colspan="4" align="center">معلومات المادة الدراسية</td></tr>
<tr>
<td>Module Title</td>
<td colspan="2">Antennas and Wave Propagation</td>
<td>Module Delivery</td>
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<tr>
<td>Module Type</td>
<td colspan="2">Core</td>
<td rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td>
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<td>Module Code</td>
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<td>ECTS Credits</td>
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<td>SWL (hr/sem)</td>
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<tr>
<td>Module Level</td>
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<tr>
<td>Administering Department</td>
<td>MCCE</td>
<td>College</td>
<td>COE</td>
</tr>
<tr>
<td>Module Leader</td>
<td>Yaseen Naser Jurn</td>
<td>e-mail</td>
<td>Yaseen.naser@uoitc.edu.iq</td>
</tr>
<tr>
<td>Module Leader's Acad. Title</td>
<td>Lecturer</td>
<td>Module Leader's Qualification</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>Module Tutor</td>
<td>Name (if available)</td>
<td>e-mail</td>
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<tr>
<td>Peer Reviewer Name</td>
<td>Name</td>
<td>e-mail</td>
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<td>Scientific Committee Approval Date</td>
<td>16/06/2023</td>
<td>Version Number</td>
<td>1.0</td>
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<tr><td colspan="4" align="center">Relation with other Modules</td></tr>
<tr><td colspan="4" align="center">العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr>
<td>Prerequisite module</td>
<td>(Electromagnetic Field 3) EMF3</td>
<td>Semester</td>
<td>3</td>
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<tr>
<td>Co-requisites module</td>
<td>None</td>
<td>Semester</td>
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Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of antenna and wave propagation through the application of techniques. 2. To understand many types of antennas, design of these antennas and wave propagation techniques for different types of propagation models. 3. This course deals with the basic concept of antenna design and wave propagation models. 4. This is the basic subject for all antenna types and propagation of electromagnetic fields. 5. To understand array of antenna and direction of arrival techniques. 6. To perform antenna design and propagation analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Understanding the basic antenna parameters of standard antenna. 2. Recognize different types of antennas. 3. Design some of antennas based on standard equations 4. Study different types of antenna arrays. 5. Summarized the direction of arrival techniques within standard principles. 6. Define and explain the smart antennas. 7. Define and explain the basics of polarization of antennas. 8. Discuss the principles of electromagnetic wave propagation. 9. Discuss the types of propagation modes. 10. Summarized the line-of-sight communication links. 11. Identification the ionosphere layers and related propagation techniques. 12. Discuss the path-loss of communication link and its related parameters.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Antennas Antenna Fundamentals – Antenna Parameters : Isotropic Radiation, Radiation intensity, Directive gain, Directivity, Power gain, Effective area, Antenna efficiency Radiation resistance, Terminal impedance, Beam width and Bandwidth, Radiation from half wave dipole, Modification of time varying and retarded case. [10 hrs] Antenna Arrays – Collinear array, Parasitic arrays, Arrays of two point sources, Arrays of 'N' sources for End fire and Broadside arrays, Pattern multiplication,Binomial arrays, Frequency scanned arrays. [10 hrs] Antenna and applications - Marconi antenna, Loop antenna, Horn antenna, Reflector antenna, Log periodic antenna, Yagi-Uda antenna, Helical antenna, Microstrip antenna, introduction to smart antenna Null Steering, Direction of arrival & Beam forming introduction. [10 hrs]

	Antenna Measurements. [10 hrs] Revision problem classes [5 hrs] Part B – Wave propagation Propagation Fundamentals- Modes of propagation, Overview Fundamental equation for free space propagation, Ground wave Propagation, Sky wave propagation, Structure of atmosphere. [10 hrs] Propagation Modes - Ionosphere Layers, ionosphere propagation, . [10 hrs] Propagation compuations – Mechanism of bending of waves, Effect of earth's, Magnetic field on Radio wave propagation, Virtual height, Skip distance,Multi-hop propagations, Space wave propagation, Super refraction, Super refraction or Duct propagation. [10 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 types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	ANTENNA FUNDAMENTALS & RADIATION FIELDS OF ANTENNAS I
Week 2	ANTENNA FUNDAMENTALS & RADIATION FIELDS OF ANTENNAS II
Week 3	ANTENNA FUNDAMENTALS & RADIATION FIELDS OF ANTENNAS II
Week 4	ANTENNA ARRAYS
Week 5	ANTENNAS & APPLICATIONS
Week 6	ANTENNAS & APPLICATIONS
Week 7	ANTENNA MEASUREMENTS
Week 8	MODES OF PROPAGATION, OVERVIEW FUNDAMENTAL EQUATION FOR FREE SPACE PROPAGATION
Week 9	MODES OF PROPAGATION, OVERVIEW FUNDAMENTAL EQUATION FOR FREE SPACE PROPAGATION
Week 10	GROUND WAVE PROPAGATION
Week 11	SKY WAVE PROPAGATION, STRUCTURE OF ATMOSPHERE
Week 12	IONOSPHERE LAYERS, IONOSPHERES PROPAGATION
Week 13	MECHANISM OF BENDING OF WAVES, EFFECT OF EARTH'S MAGNETIC FIELD ON RADIO WAVE PROPAGATION
Week 14	VIRTUAL HEIGHT, SKIP DISTANCE, MULTI-HOP PROPAGATIONS.
Week 15	SPACE WAVE PROPAGATION, SUPER REFRACTION, SUPER REFRACTION OR DUCT PROPAGATION
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to WATS-2002
Week 2	Lab 2: Antenna Characteristics Measurement
Week 3	Lab 3: E-Plane radiation pattern experiment sequence for dipole antenna and loop antenna
Week 4	Lab 4: E-Plane radiation pattern experiment sequence for yagi antenna and LPDA antenna
Week 5	Lab 5: Radiation pattern experiment sequence Voltage Standing Wave / dipole antenna
Week 6	Lab 6: Radiation pattern experiment sequence Voltage Standing Wave / Yagi antenna
Week 7	Lab 7: S11 parameters

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- J.D. Kraus, RJ. Marhefka and Ahmad S. Khan. TMH "Antennas and Wave Propagation", New Delhi, 4'h ed., (Special Indian Edition). - John Wiley & Sons Ballany , "Antenna Theory " , second edition. - A.R.Harish, M.Sachidanada, "Antennas and Wave propagation", Oxford University Press	Yes
Recommended Texts	K.D. PRASAD, "Antenna & Wave Propagation" Copyright Year: 2020	No
Websites	https://www.academia.edu/34100485/Lecture_Notes_Antenna_and_Wave_Propagation_B_TECH_ECE_III_YEAR_I_SEMESTER_JNTUA_R13	

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

<table>
<tr><td colspan="5" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2" align="center">Computer Networks I</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2" align="center">Core</td><td colspan="2" rowspan="4">☒ Theory
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<tr><td>ECTS Credits</td><td colspan="2" align="center">5.0</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2" align="center">125</td></tr>
<tr><td>Module Level</td><td>3</td><td>Semester of Delivery</td><td colspan="2">5</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td colspan="2">COE</td></tr>
<tr><td>Module Leader</td><td>Ali Hussein Alnooh</td><td>e-mail</td><td colspan="2">ali.alnooh@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>lecturer</td><td>Module Leader's Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Level 2	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course typically aim to provide students with a fundamental understanding of networking principles, protocols, and technologies. Here are some common module objectives: 1- Understanding Networking Concepts: The module aims to familiarize students with the basic concepts and terminology used in computer networks. This includes topics such as network topologies, network models (like OSI and TCP/IP), network components (routers, switches, etc.), and network addressing. 2- Understanding Network Protocols and Standards: Students learn about various network protocols and standards that enable communication between devices. This includes protocols like TCP/IP, ARP, ICMP others. The module aims to provide an understanding of their functionalities, addressing schemes, and how they facilitate reliable data transmission. 3- Understanding Network Architecture and Design: This objective focuses on teaching students how to design and implement computer networks. 4- Understanding Network Management and Troubleshooting: Students learn about techniques and tools for managing and monitoring computer networks. They explore network administration tasks, such as configuring devices, managing network resources, and troubleshooting common network issues. 5- Apply concepts listed above by designing a small network.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Understand the main components and working principles of Computer Networks, 2) Understand the networking devices, 3) Understand the Computer Networks Model Layers, 4) Understand Subnetting and Network Design, 5) Understand the Forwarding and Routing Techniques 6) Understand the Physical Routing between nodes 7) Understand the Logical Routing between nodes 8) Understand the Structure of the IP Datagram 9) Understand the Network Testing Tools 10) Understand Internet Architecture
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A – Computer Networks Fundamentals [12 hrs.]** This part will give a brief description to computer network fundamentals for topics like topologies, types, client-server messages and network layers

	Part B – Network Connectivity [10 hrs.]
	This part will discuss networking devices with respect to the layers and passing messages taken in the previous part
	Part C – Addressing and Routing [30 hrs.]
	This part will discuss deeply all the IP classes, subnetting, supernetting and route summarization. Also will clarify the routing types i.e. static and dynamic
	Part D – Network Testing [8 hrs.]
	After designing any network, the students will be able to test the connectivity between the connected devices, this will be done through the use of **PING** and **Tracert** Tools

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 types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
Week no.	**Material Covered**
Week 1	Introduction to Computer Networks Types
Week 2	Types of Connections and Networking Terms
Week 3	Networking Devices (Hub, Bridge, Switch and Router)
Week 4	Network Layers (OSI and TCP/IP) Protocol Suite
Week 5	Addressing (Physical and Logical Addressing)
Week 6	Classfull and Classless Addressing*
Week 7	Mid-term Exam
Week 8	Subnetting Part I
Week 9	Subnetting Part II
Week 10	Delivery and Forwarding
Week 11	Internet Protocol Version 4 (IPv4) Part I
Week 12	Internet Protocol Version 4 (IPv4) Part II
Week 13	Address Resolution Protocol (ARP)
Week 14	Internet Control Message Protocol (ICMP)
Week 15	Seminar Discussion
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
Week no.	**Material Covered**
Week 1	Introduction to Computer Networks
Week 2	Types of Network Cabling Part I
Week 3	Wireless Devices
Week 4	Introduction to Packet Tracer Simulation
Week 5	Setting Addresses and Network Masks
Week 6	Proposing a LAN Scenario
Week 7	Mid-term Exam

Week 8	Proposing a WAN Scenario
Week 9	Static Routing Scenario Part I
Week 10	Static Routing Scenario Part II
Week 11	Virtual Local Area Network Setup
Week 12	IP Packet Sniffing tool
Week 13	Address Resolution Protocol Cases
Week 14	Ping and Tracert Tools
Week 15	Report Discussion
Week 16	Review

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	TCP/IP Protocol Suite. Behrouz A. Forouzan, 4th Edition, Mc-Graw Hill, 2010	Yes
Websites		

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A – Excellent**	امتياز	90 - 100	Outstanding Performance
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<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center"><b style="color:red">Digital Communications</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Core</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center"><b style="color:red">DCM5</td></tr>
<tr><td>ECTS Credits</td><td align="center">6.0</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center"><b style="color:red">150</td></tr>
<tr><td>Module Level</td><td>3</td><td>Semester of Delivery</td><td>5</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td>COE</td></tr>
<tr><td>Module Leader</td><td>Nadhir Ibrahim ABDULKHALEQ</td><td>e-mail</td><td>Nadhir.abdulkhaleq@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Asst. Professor</td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>none</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td>1.0</td></tr>
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<table>
<tr><td colspan="4" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Communication Fundamentals (CMF4)</td><td>Semester</td><td>4</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understanding the need for switching to digital signals and techniques. 2. Understanding the main blocks of DCS. 3. Understanding and practicing theory and problems of sampling theorem. 4. Solving the problems for aliasing. 5. Understanding and practicing theory and problems for PCM and decoding process. 6. Understanding and practicing theory and problems of digital modulation techniques. 7. Understanding the types of communication channels.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Ability to compare between analog and digital signals behavior. 2. Ability to define the function of each block in the DCS stages. 3. Solving the problems of sampling frequency selection. 4. Ability to solve the problems of aliasing. 5. Ability to define and solve the problems of PCM. 6. Define and solve problems for PAM. 7. Define and solve problems for PPM digital modulation 8. Define and solve problems for PWM digital modulation 9. Define and solve problems for ASK digital modulation. 10. Define and solve problems for FSK digital modulation. 11. Define and solve problems for PSK digital modulation. 12. Define and solve problems for QAM digital modulation. 13. Define and compare different types of multiplexing 14. Define the features and solve problems for TDM.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Formatting stage Introduction -- The main features of digital signals and systems, introduction to sampling theorem, Nyquist rate, Nyquist criterion, ideal sampling, natural sampling, aliasing, signal reconstruction techniques [15 hrs] PCM – block diagram for pulse code modulation, feature and rules for uniform quantization, solving problems for uniform quantizer, block diagram and features of differential PCM. Block diagram and features for delta modulation [15 hrs] Part B – Base-band modulation PAM – features and block diagram for PAM . [5 hrs] PPM- features and block diagram for PPM . [5hrs] PWM- features and block diagram for PWM . [5 hrs]

	Part C – Pass-band modulation
	ASK--The features of shift-keying modulation, block diagram for ASK modulator, formula and examples for Ask signals, block diagram for ASK demodulator, calculation of ASK signal bandwidth. [5 hrs].
	FSK-- block diagram for FSK modulator, formula and examples for FSK signals, block diagram for FSK demodulator, calculation of FSK signal bandwidth. [5 hrs].
	PSK-- block diagram for PSK modulator, formula and examples for PSK signals, block diagram for PSK demodulator, calculation of FSK signal bandwidth. [5 hrs].
	QAM-- block diagram for QAM modulator, formula and examples for QAM signals, block diagram for QAM demodulator, calculation of FSK signal bandwidth. [5 hrs].
	Part D – Multiplexing
	Define and compare the different types of multiplexing, gives the main features for TDM and its structure with examples for its application. Compare the performance for TDM and FDM with respect to time delay and data rate. [10 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The student must attend this module to get the basic information about his specialization. The lecture notes will be given in parallel with the experimental lab. The progress in understanding the giving lectures will be tested through daily oral exams and monthly written one. Additional homework is required to solve the mathematical problems in each topic. The main evaluation will be on the midterm exams which is planned to be two in this module.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

<table>
<tr><td colspan="6" align="center">Module Evaluation
تقييم المادة الدراسية</td></tr>
<tr><td></td><td></td><td>Time/Number</td><td>Weight (Marks)</td><td>Week Due</td><td>Relevant Learning Outcome</td></tr>
<tr><td rowspan="4">Formative assessment</td><td>Quizzes</td><td>2</td><td>10% (10)</td><td>5 and 10</td><td>LO #1, #2 and #10, #11</td></tr>
<tr><td>Assignments</td><td>2</td><td>10% (10)</td><td>2 and 12</td><td>LO #3, #4 and #6, #7</td></tr>
<tr><td>Projects / Lab.</td><td>1</td><td>10% (10)</td><td>Continuous</td><td>All</td></tr>
<tr><td>Report</td><td>1</td><td>10% (10)</td><td>13</td><td>LO #5, #8 and #10</td></tr>
<tr><td rowspan="2">Summative assessment</td><td>Midterm Exam</td><td>2hr</td><td>10% (10)</td><td>7</td><td>LO #1 - #7</td></tr>
<tr><td>Final Exam</td><td>3hr</td><td>50% (50)</td><td>16</td><td>All</td></tr>
<tr><td colspan="2">Total assessment</td><td></td><td>100% (100 Marks)</td><td></td><td></td></tr>
</table>

<table>
<tr><td colspan="2" align="center">Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري</td></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Introduction – main feature of digital systems</td></tr>
<tr><td>Week 2</td><td>Sampling theory, definition of Nyquist rate and criteria, spectrum of sampled signal</td></tr>
<tr><td>Week 3</td><td>Aliasing, cause and mitigation of aliasing, methods for signal reconstruction from sampled version</td></tr>
<tr><td>Week 4</td><td>PCM block diagram, types of quantizer, features of uniform quantizer , types of encoder</td></tr>
<tr><td>Week 5</td><td>Problems on calculation of uniform quantizer parameters</td></tr>
<tr><td>Week 6</td><td>Differential PCM ,ADPCM and delta modulation</td></tr>
<tr><td>Week 7</td><td>Mid-term Exam</td></tr>
<tr><td>Week 8</td><td>Pulse modulation types and features of PAM and its application</td></tr>
<tr><td>Week 9</td><td>PWM and PPM block diagrams and their applications</td></tr>
<tr><td>Week 10</td><td>Pass band digital modulation, features and block diagram for BASK.</td></tr>
<tr><td>Week 11</td><td>Pass band digital modulation, features and block diagram for BFSK.</td></tr>
<tr><td>Week 12</td><td>Pass band digital modulation, features and block diagram for BPSK.</td></tr>
<tr><td>Week 13</td><td>Pass band digital modulation, features and block diagram for QAM.</td></tr>
<tr><td>Week 14</td><td>Performance comparison between all digital modulation types</td></tr>
<tr><td>Week 15</td><td>Review and chance for second mid term</td></tr>
<tr><td>Week 16</td><td>Preparatory week before the final Exam</td></tr>
</table>

<table>
<tr><th colspan="2">Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر</th></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Lab 1: Introduction to MATLAB and Simulink</td></tr>
<tr><td>Week 2</td><td>Lab 2: Sampling Process</td></tr>
<tr><td>Week 3</td><td>Lab 3: Aliasing</td></tr>
<tr><td>Week 4</td><td>Lab 4: PAM modulation and demodulation</td></tr>
<tr><td>Week 5</td><td>Lab 5: PPM and PWM modulation and demodulation</td></tr>
<tr><td>Week 6</td><td>Lab 6: digital modulation- BASK modulation and demodulation</td></tr>
<tr><td>Week 7</td><td>Lab 7: digital modulation- BFSK modulation and demodulation</td></tr>
<tr><td>Week 8</td><td>Lab 8: digital modulation- BPSK modulation and demodulation</td></tr>
<tr><td>Week 9</td><td>Lab 9: digital modulation- QAM modulation and demodulation</td></tr>
<tr><td>Week 10</td><td>Lab exam</td></tr>
</table>

<table>
<tr><th colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</th></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Proakis, John G. Digital communications. McGraw-Hill, Higher Education, 2008.</td><td>Yes</td></tr>
<tr><td>Recommended Texts</td><td>Module lecture notes</td><td>Yes</td></tr>
<tr><td>Websites</td><td></td><td></td></tr>
</table>

<table>
<tr><th colspan="5">Grading Scheme
مخطط الدرجات</th></tr>
<tr><td>Group</td><td>Grade</td><td>التقدير</td><td>Marks %</td><td>Definition</td></tr>
<tr><td rowspan="5">Success Group (50 - 100)</td><td>A - Excellent</td><td>امتياز</td><td>90 - 100</td><td>Outstanding Performance</td></tr>
<tr><td>B - Very Good</td><td>جيد جدا</td><td>80 - 89</td><td>Above average with some errors</td></tr>
<tr><td>C - Good</td><td>جيد</td><td>70 - 79</td><td>Sound work with notable errors</td></tr>
<tr><td>D - Satisfactory</td><td>متوسط</td><td>60 - 69</td><td>Fair but with major shortcomings</td></tr>
<tr><td>E - Sufficient</td><td>مقبول</td><td>50 - 59</td><td>Work meets minimum criteria</td></tr>
<tr><td rowspan="2">Fail Group (0 – 49)</td><td>FX – Fail</td><td>راسب (قيد المعالجة)</td><td>(45-49)</td><td>More work required but credit awarded</td></tr>
<tr><td>F – Fail</td><td>راسب</td><td>(0-44)</td><td>Considerable amount of work required</td></tr>
<tr><td colspan="5"></td></tr>
</table>

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	**Space Science I**		**Module Delivery**	
Module Type	**Elective**		☒ Theory	
Module Code	**SSC5**		☐ Lecture	
ECTS Credits	**3.0**		☐ Lab	
SWL (hr/sem)	**75**		☐ Tutorial ☐ Practical ☐ Seminar	
Module Level	3	**Semester of Delivery**	5	
Administering Department	MCCE	**College**	COE	
Module Leader	Firas Ayad	**e-mail**	firas.ayad@uoitc.edu.com	
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)	**e-mail**	E-mail	
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Electronic physics (EPH1)	**Semester**	1
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To introduce students to the fundamental concepts and principles of space science. 2. To develop students' understanding of the Earth's atmosphere, ionosphere, and magnetosphere and their interactions with space-based systems. 3. To familiarize students with satellite communication systems, including the design and operation of communication satellites. 4. To provide students with knowledge of orbital mechanics, including satellite orbits and launch mechanisms. 5. To explore the principles and applications of remote sensing in space science and engineering. 6. To develop an understanding of the impact of space weather on satellite communication systems. 7. To develop an understanding of the impact of space weather on satellite communication systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the fundamental principles and theories of space science and their applications in communications engineering. 2. Define and utilize the essential terminology, concepts, and mathematical tools relevant to space science. 3. Apply the laws of motion and gravitation to analyze and predict the behavior of objects in space. 4. Analyze and interpret various types of orbits and understand their significance in satellite communication systems. 5. Explain the functioning and components of satellite systems, including their role in global communication networks. 6. Evaluate the different types of launch vehicles and propulsion systems used in space missions. 7. Understand the principles and applications of remote sensing and Earth observation from space. 8. Explain the impact of space weather phenomena on communication systems and assess mitigation strategies. 9. Describe the operation and applications of Global Navigation Satellite Systems (GNSS) such as GPS. 10. Analyze and discuss current trends, challenges, and future directions in space science and its impact on communications engineering.

Indicative Contents
 	
المحتويات الإرشادية
	Indicative content includes the following.
	
	1. Introduction to Space Science
	   • Historical overview of space exploration
	   • Importance of space science in communications engineering. [5 hrs]
	2. Laws of Motion and Gravitation
	   • Newton's laws and their applications in space

	• Gravitational forces and their effects on objects in space. [5 hrs]
	3. Celestial Mechanics and Orbits
	• Kepler's laws of planetary motion
	• Types of orbits: circular, elliptical, geostationary, etc.
	• Satellite orbital parameters and calculations. [5 hrs]
	4. Satellite Systems and Communication
	• Communication satellite architecture and subsystems
	• Satellite orbits for communication purposes
	• Link budget analysis for satellite communication. [5 hrs]
	5. Launch Vehicles and Propulsion
	• Principles of rocket propulsion
	• Types of launch vehicles and their characteristics
	• Launch procedures and mission planning. [5 hrs]
	6. Remote Sensing and Earth Observation
	• Remote sensing techniques from space
	• Applications of satellite imagery for Earth observation
	• Data acquisition, processing, and interpretation. [4 hrs]
	7. Space Weather and its Effects on Communications
	• Overview of space weather phenomena
	• Impact of space weather on satellite communication systems
	• Mitigation strategies and technologies. [4 hrs]
	8. Global Navigation Satellite Systems (GNSS)
	• Principles and functioning of GNSS
	• GPS (Global Positioning System) architecture and operation
	• Applications of GNSS in navigation and timing. [4 hrs]
	9. Space Exploration and Missions
	• Manned and unmanned space missions
	• Interplanetary exploration and future space missions
	• Challenges and advancements in space exploration. [4 hrs]
	10. Current Trends and Future Directions in Space Science
	• Emerging technologies and trends in space science
	• Space-based communication innovations and possibilities
	• Ethical and environmental considerations in space exploration. [4 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Space Science I is an introductory course designed to provide students with a comprehensive understanding of fundamental concepts and principles related to space science. The course aims to equip students with a solid foundation in the field of space science, focusing on topics relevant to communications engineering.

<table>
<tr><td colspan="4" align="center">**Student Workload (SWL)**
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr><td>**Structured SWL (h/sem)**
الحمل الدراسي المنتظم للطالب خلال الفصل</td><td>48</td><td>**Structured SWL (h/w)**
الحمل الدراسي المنتظم للطالب أسبوعيا</td><td>3</td></tr>
<tr><td>**Unstructured SWL (h/sem)**
الحمل الدراسي غير المنتظم للطالب خلال الفصل</td><td>27</td><td>**Unstructured SWL (h/w)**
الحمل الدراسي غير المنتظم للطالب أسبوعيا</td><td>1</td></tr>
<tr><td>**Total SWL (h/sem)**
الحمل الدراسي الكلي للطالب خلال الفصل</td><td colspan="3" align="center">**75**</td></tr>
</table>

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Space Science
Week 2	Laws of Motion and Gravitation
Week 3	Celestial Mechanics and Orbits
Week 4	Satellite Systems and Communication
Week 5	Link Budget Analysis for Satellite Communication
Week 6	Launch Vehicles and Propulsion
Week 7	Launch Procedures and Mission Planning

Week 8	Remote Sensing and Earth Observation
Week 9	Data Acquisition, Processing, and Interpretation
Week 10	Space Weather and its Effects on Communications
Week 11	Mitigation Strategies and Technologies
Week 12	Global Navigation Satellite Systems (GNSS)
Week 13	Applications of GNSS in Navigation and Timing
Week 14	Space Exploration and Missions
Week 15	Challenges and Advancements in Space Exploration
Week 16	Current Trends and Future Directions in Space Science

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Space Science" by Gregory L. Matloff	No
Recommended Texts	Fundamentals of Satellite Communications" by K.N. Raja Rao	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	Elective	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	**WDG5**	
ECTS Credits	**5**	
SWL (hr/sem)	**125**	

Module Level	3	**Semester of Delivery**	5
Administering Department	MCCE	**College**	COE
Module Leader	Maha Khalil Ibrahim	**e-mail**	Maha.ibrahim@uoitc.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	MS.c
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Computer Programming II (CPR3)	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	- Recognize and understand HTML web page elements - Know how to write HTML code - Understand and apply effective web design principles

	- Enhance web pages using text formatting, color, images, and multimedia - Incorporate forms into web pages - Understand and apply CSS to format web page elements - Plan, design, and publish a multi-page website - Understand the basics of javascript language. - Introducing Javascript as a scripting language. - Knowing Javascript as an object oriented langue. - Using javascript in forms and forms validation. - Plan, design, and publish a multi-page and dynamic website. - Design PHP based web pages using correct php, css, and syntax structure. - Create Web forms and pages that properly use HTTP GET and POST protocol as appropriate. - Design SQL language within MySQL and PHP to access and manipulate databases. - Install and configure both PHP and MySQL. - Demonstrate use of cookie, session, and authentication programming in PHP. - Design and create a complete web site that demonstrates good PHP/MySQL client/server design.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- To create an Information Architecture document for a web site. 2- To develop technical skills in the creation of high quality, usable, accessible web applications using industry-standard technologies. 3- To construct a web site that conforms to the web standards of today 4- To develop design skills for web applications with a variety of purposes and target user groups. 5- To understand the different approaches towards designing and developing web applications for different device types for responsive design. 6- To connect the website with a web server . 7- To learn how to connect the web page with a database.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part One :An introduction to web technology, introducing HTML(the HTML page structure ,tha basic HTML tags, lists types and tables. HTML images , HTML Formatting and colors, HTML styles, HTML forms [4 hours] Part Two:HTML CSS, HTML media, HTML blocks, HTML classes &id , Using CSS to Style a Site, Using CSS to Position Elements on the Page, CSS box model [6 hours] Part Three :Introduction to Javascript,Data Types and Variables, Decisions and Loops, Date, Time and Timers ,DOM Scripting Events, Forms and forms validation. [8 hours] Part Four:Introduction to PHP, Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression.[10 hours]

	Part Five :Decisions and loop, Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.[6 hours]
	Part Six: Function What is a function, Define a function, Call by value and Call by reference, Recursive function, String, Creating and accessing, String Searching & Replacing String, Formatting String, String, Related Library function[10 hours]
	Part Seven: Array Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function.[10 hours]
	Part Eight Handling Html Form with Php Capturing Form, Data Dealing with Multi-value filed, GET and POST, Generating File uploaded form, redirecting a form after submission [6 hours]
	Part Nine :Session and Cookie Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.[5 hours]
	Part Ten: Database Connectivity with MySql Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.) [10 hours]

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 types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem)	47	Unstructured SWL (h/w)	3

	الحمل الدراسي غير المنتظم للطالب أسبوعيا		الحمل الدراسي غير المنتظم للطالب خلال الفصل
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment		100% (100 Marks)			

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	An introduction to web technology, introducing HTML(the HTML page structure ,tha basic HTML tags, lists types and tables.
Week 2	HTML images , HTML Formatting and colors, HTML styles, HTML forms
Week 3	HTML CSS, HTML media, HTML blocks, HTML classes &id
Week 4	Using CSS to Style a Site, Using CSS to Position Elements on the Page, CSS box model
Week 5	Introduction to Javascript,Data Types and Variables, Decisions and Loops
Week 6	Date, Time and Timers ,DOM Scripting Events, Forms and forms validation
Week 7	Mid-term Exam
Week 8	Introduction to PHP,Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression
Week 9	Decisions and loop, Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.
Week 10	**Function**

	What is a function, Define a function, Call by value and Call by reference, Recursive function, String, Creating and accessing, String Searching & Replacing String, Formatting String, String, Related Library function
Week 11	**Array** Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function.
Week 12	**Handling Html Form with Php** Capturing Form, Data Dealing with Multi-value filed, GET and POST, Generating File uploaded form, redirecting a form after submission
Week 13	**Session and Cookie** Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.
Week 14	**Database Connectivity with MySql** Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.)
Week 15	**Connecting database with PHP**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction HTML tags, HTML formatting lists and images
Week 2	Lab 2: Using CSS to Position Elements on the Page, CSS box model
Week 3	Lab 3：Javascript,Data Types and Variables, Decisions and Loops
Week 4	Lab4: Date, Time and Timers ,DOM Scripting Events, Forms and forms validation
Week 5	Lab 5: Introduction to PHP,Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression
Week 6	Lab 6: Decisions and loop using for loop and for each examples, Functions declaration,using functions in program
Week 7	Lab 7: Dealing with arrays, Handling Html Form with Php Capturing Form, Data Dealing with Multi-value filed, GET and POST, Generating File uploaded form, redirecting a form after submission

Week 8	**Session and Cookie**. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.
Week 9	Database Connectivity with MySql
Week 10	Connecting PHP with mysql.

| **Learning and Teaching Resources** |||
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	-Laura Lemay, Rafe Coburn ,Jennifer Kyrnin , "SamsTeach Yourself HTML, CSS & JavaScript Web Publishing" ,7the edition , by Pearson Education, Inc. 2016 - Jeremy McPeak ,Beginning javascript, 5th edition ,2017 -Learning PHP A GENTLE INTRODUCTION TO THE WEB'S MOST POPULAR LANGUAGE, David Sklar,2016	Yes
Recommended Texts		
Websites	www.w3schools.com www.javapoint.com	

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

المرحلة: **الثالثة**

الفصل الدراسي: **السادس**

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2" align="center">Computer Networks II</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2" align="center">Core</td><td rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2" align="center">CNT6</td></tr>
<tr><td>ECTS Credits</td><td colspan="2" align="center">6.0</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2" align="center">150</td></tr>
<tr><td>Module Level</td><td>3</td><td>Semester of Delivery</td><td>6</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td>COE</td></tr>
<tr><td>Module Leader</td><td>Ali Hussein Alnooh</td><td>e-mail</td><td>ali.alnooh@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Lecturer</td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td>1.0</td></tr>
</table>

Prerequisite module	Computer network I (CNT5)	**Semester**	5
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	The objectives of this module typically focus on providing students with a comprehensive understanding of various networking protocols and their functionalities. Here are some common objectives covered in this module: 1. Dynamic Routing Protocols Overview: Students learn about the major dynamic routing protocol suites used in computer networks, such as the RIP and OSPF. 2. Application Layer Protocols: Students are introduced to various application layer protocols used for specific network services. This can include protocols like HTTP (Hypertext Transfer Protocol), DNS (Domain Name System), FTP (File Transfer Protocol), SMTP (Simple Mail Transfer Protocol), DHCP (Dynamic Host Configuration Protocol) and more. The objective is to understand their functionalities and how they enable specific network applications. 3. Security Protocols: This objective focuses on introducing students to security protocols used in computer networks, such as IPsec (Internet Protocol Security) and VPN (Virtual Private Network). Students gain an understanding of their role in ensuring secure communication, encryption, and authentication. 4. Network Administration Skills: Students learn the environment of Network Administration using a virtual networks by simulating the resources sharing and users' privileges through policies and users rights. 5. Emerging Protocol Technologies: The module may cover emerging protocol technologies or advancements, such as SDN (Software-Defined Networking) and others. Students explore these technologies to understand their features, benefits, and potential impact on future networks.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Understand the main components and working principles of Computer Networks Protocols, 2) Understand the Dynamic Routing Protocols, 3) Understand the Application Layer Protocols, 4) Understand Network security Issues,

	5) Understand Network Administration path,
	6) Viewing some new emerging techniques like SDN and MPLS
	7) Ability to design and build a Hypothesis Intranet
	8) Ability to understand how the (WWW) World Wide Web works
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A –Network Protocols [36 hrs.]** This part will describe too many protocols by lightning the structure of each protocol with the consideration to each field inside it **Part B – Network Security [10 hrs.]** This part will discuss some important security issues related to computer networks like the use of firewall and proxy servers, also the use of VPN through any network **Part C – Network Administration [10 hrs.]** This part will concentrate on the topics related to network administration especially on the remote servers login **Part D – Emerging Protocols [4 hrs.]** This part will take the new emerging protocols like SDN and MPLS, also this part will be done through students seminars

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted for this module is the Discussions and Debates: Classroom discussions and debates can stimulate critical thinking and active engagement with network protocol concepts. Instructors can pose thought-provoking questions, encourage students to share their perspectives, and facilitate discussions around protocol design choices, performance trade-offs, or emerging trends.

<table>
<tr><th colspan="4" style="text-align:center">Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</th></tr>
</table>

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		**150**	

<table>
<tr><th colspan="6" style="text-align:center">Module Evaluation

تقييم المادة الدراسية</th></tr>
</table>

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
Week no.	**Material Covered**
Week 1	Internet Protocol Version 6 (IPv6)
Week 2	Dynamic Routing Protocols (RIP) Routing Information Protocol
Week 3	Dynamic Routing Protocols (OSPF) Open Shortest Path First)
Week 4	Application Layer Protocols (DHCP) Dynamic Host Configuration Protocol
Week 5	Application Layer Protocols (DNS) Domain Network System
Week 6	Application Layer Protocols (FTP) File Transfer Protocol
Week 7	Mid-term Exam
Week 8	Application Layer Protocols (HTTP) Hyper Text Transfer Protocol
Week 9	Application Layer Protocols (SMTP) Simple Mail Transfer Protocol
Week 10	Application Layer Protocols (TELNET) Protocol
Week 11	Application Layer Protocols (RDP) Remote Desktop Protocol
Week 12	Network Security: (VPN) Virtual Private Networks
Week 13	Network Security: Firewall and Proxy Servers
Week 14	Emerging Protocol Technologies: (SDN) Software-Defined Networking and Multi-Protocol Label Switching
Week 15	Seminar Discussion
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
Week no.	**Material Covered**
Week 1	How Internet Works
Week 2	Packet Tracer RIP Experiment
Week 3	Packet Tracer OSPF Experiment
Week 4	Packet Tracer DHCP Experiment
Week 5	Packet Tracer DNS Experiment
Week 6	Packet Tracer FTP Experiment
Week 7	Mid-term Exam

Week 8	Packet Tracer HTTP Experiment
Week 9	Packet Tracer SMTP Experiment
Week 10	Packet Tracer TELNET Experiment
Week 11	Packet Tracer VPN Experiment
Week 12	Installation of Active Directory using Virtual Box Simulation
Week 13	Authentication and Authorization Experiment
Week 14	Sever Backup Types
Week 15	Report Discussion
Week 16	Review

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	TCP/IP Protocol Suite. Behrouz A. Forouzan, 4th Edition, Mc-Graw Hill, 2010	Yes
Websites		

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

<table>
<tr><td colspan="3" align="center">Module Information</td></tr>
<tr><td colspan="3" align="center">معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center">Digital Signal Processing</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Elective</td><td rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center">DSP6</td></tr>
<tr><td>ECTS Credits</td><td align="center">5</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center">125</td></tr>
</table>

Module Level	3	Semester of Delivery	6
Administering Department	MCCE	College	COE
Module Leader	Nadhir Ibrahim abdulkhaleq	e-mail	nadhir.abdulkhaleq@uoitc.edu.iq
Module Leader's Acad. Title	Lecturer Dr.	Ph.D.	
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	16/06/2023	Version Number	1.0

<table>
<tr><td colspan="4" align="center">Relation with other Modules</td></tr>
<tr><td colspan="4" align="center">العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Mathematics II (MAT2)</td><td>Semester</td><td>2</td></tr>
<tr><td>Co-requisites module</td><td></td><td>Semester</td><td></td></tr>
</table>

<table>
<tr><td colspan="2" align="center">Module Aims, Learning Outcomes and Indicative Contents</td></tr>
<tr><td colspan="2" align="center">أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Objectives
أهداف المادة الدراسية</td><td>Give the student a clear view about the principles of digital signal processing, the difference between digital and continuous signals, filter kinds, and its applications.</td></tr>
</table>

1

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Review of discrete signals and systems, 2. Discrete Fourier series, 3. Discrete Fourier transform, 4. Convolution and correlation, 5. Discrete and fast Fourier transform, 6. Z- transform, 7. Framework for digital filter design, 8. Finite impulse response digital filter design, 9. Infinite impulse response digital filter design, Applications of filter banks in audio & image processing. 10. Noise calculation

Indicative Contents
 	
المحتويات الإرشادية
	Indicative content includes the following:
	Part A: **Theory**
	1. **Introduction(5 hours)**
	    1. Basic elements of Digital Signal Processing,
	    2. Need of Digital Signal Processing over Analog Signal Processing,
	    3. A/D and D/A conversion,
	    4. Sampling continuous signals and spectral properties of sampled signals
	2. **Discrete-time Signals and System(5 hours)**
	    1. Elementary discrete-time signals,
	    2. Linearity, Shift invariance, Causality of discrete systems,
	    3. Recursive and Non-recursive discrete-time systems,
	    4. Convolution sum and impulse response,
	    5. Linear Time-invariant systems characterized by constant coefficient difference equations,
	3. **Z-Transform (5 hours)**
	    1. Definition of the z-transform,
	    2. One-side and two-side transforms, ROC, Left-side, Right-sided and two-sided sequences, Region of convergence, Relationship to causality,
	    3. Inverse z-transform-by long division, by partial fraction expansion,
	    4. Z-transform properties-delay advance, Convolution, Parseval's theorem,
	4. **Discrete Fourier Transform (5 hours)**
	    1. Definition and applications, Frequency domain sampling and for reconstruction, Forward and Reverse transforms, Relationship of the DFT to other transforms,
	    2. Properties of the Discrete Fourier Transform: Periodicity, Linearity and Symmetry Properties, Multiplication of two DFTs and Circular Convolution, Time reversal, Circular time shift and Multiplication of two sequences circular frequency shift, Circular correlation and Parseval's Theorem,
	5. **Implementation of Discrete-time System(6 hours)**
	    1. Structures for FIR and IIR, Direct Form, Cascaded and parallel form, Lattice for FIR,

2. Conversion between direct form and lattice and vice verse, Lattice and lattice-ladder for IIR,
3. Frequency response,
4. Digital filters, finite precision implementations of discrete filters,
5. Representation of Numbers; fixed point and floating binary point, Effect of Rounding and truncation; Limit cycle oscillations effect,

6. **IIR Filter Design (4 hours)**
   1. IIR Filter Design: IIR filter design by classical filter design using low pass approximations Butterworth, Chebychev, Inverse Chebyshev, Elliptic and Bessel-Thompson filters,
   2. IIR filter design by Impulse-invariant method, Bilinear Transformation Method, Matched z-transform method,
   3. IIR lowpass discrete filter design using bilinear transformation

7. **FIR Filter Design(5 hours)**
   1. FIR filter design by Fourier approximation,
   2. Gibbs phenomena in FIR filter design, Design of Linear Phase FIR filters using window function, Applications of window functions to frequency response smoothing,
   3. Window functions, Rectangular, Hamming, Blackman and Kaiser windows,
   4. Design of linear phase FIR filter by the frequency sampling method,
   5. FIR filter design using the Remez exchange algorithm,

8. **Digital Filter Implementation(5hours)**
   1. Implementations using special purpose DSP processors,
   2. Bit-serial arithmetic, pipelined implementations,
   3. Distributed arithmetic implementations.

Part B: **Practical**
1. Study the behavior of a simple digital notch filter. **(3 houre)**
2. Response of a recursive digital. **(4 houre)**
3. Scaling, dynamic range and noise behavior of a recursive digital filter, observation of nonlinear finite precision effects. **(4 houre)**
4. Response of a non-recursive digital filter, Implementation in Impulse Invariant and Bilinear Transformation. **(3 houre)**
5. Band pass filters implemented using cascade second order sections and wave or ladder filters, Comparison of implementations. **(4 houre)**
6. Design of FIR filter using window method, Comparison of FIR filter for different windowing method. **(2 houre)**

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 types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

<table>
<tr><td colspan="4" align="center">الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr>
<td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل</td>
<td>63</td>
<td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td>
<td>4</td>
</tr>
<tr>
<td>Unstructured SWL (h/sem)
الحمل الدراسي غير المنتظم للطالب خلال الفصل</td>
<td>62</td>
<td>Unstructured SWL (h/w)
الحمل الدراسي غير المنتظم للطالب أسبوعيا</td>
<td>4</td>
</tr>
<tr>
<td>Total SWL (h/sem)
الحمل الدراسي الكلي للطالب خلال الفصل</td>
<td colspan="3" align="center">125</td>
</tr>
</table>

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Review of Discrete Signals and Systems
Week 2	Convolution and Correlation
Week 3	Discrete Fourier Series (DFS)
Week 4	Discrete Fourier Transform (DFT)
Week 5	Fast Fourier Transform I
Week 6	Fast Fourier Transform II
Week 7	Mid-term Exam
Week 8	Z Transform I
Week 9	Z Transform II

Week 10	Digital Filters Realization
Week 11	Finite Impulse Response Digital Filter Design (FIR)
Week 12	Infinite Impulse Response Digital Filter Design (IIR) I
Week 13	Infinite Impulse Response Digital Filter Design (IIR) II
Week 14	Advanced DSP.
Week 15	Midterm Exam. (2)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Discrete Signals
Week 2	Lab 2: Convolution and Correlation
Week 3	Lab 3: Discrete Fourier Series
Week 4	Lab 4: Discrete Fourier Transform
Week 5	Lab 5: Fast Fourier Transform
Week 6	Lab 6: Fast Fourier Transform
Week 7	Lab 7: Test I
Week 8	Lab 8: Z Transform I
Week 9	Lab 9: Z Transform II
Week 10	Lab 10: Digital Filters
Week 11	Lab 11: FIR design
Week 12	Lab 12: IIR design
Week 13	Lab 13: IIR design
Week 14	Lab 14:
Week 15	Lab 15:

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	" Digital Signal Processing Practical Approach", By Emmanuel and Barrie, 2001	Yes
Recommended Texts	Digital Signal Processing with Computer Applications", John Wiley & Sons , 1997 By PAUL A. LYNN.	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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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center"><strong style="color:red">Information Theory and Coding</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Core</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center"><strong style="color:red">ICT6</td></tr>
<tr><td>ECTS Credits</td><td align="center">6</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center"><strong style="color:red">150</td></tr>
<tr><td>Module Level</td><td>3</td><td>Semester of Delivery</td><td>6</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td>COE</td></tr>
<tr><td>Module Leader</td><td>Nadhir Ibrahim ABDULKHALEQ</td><td>e-mail</td><td>nadhir.abdulkhaleq@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Asst. Professor</td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td>1.0</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Communication fundamentals (CMF4)+Statistics and probability (STP3)</td><td>Semester</td><td>3+4</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

	Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية		

Module Objectives أهداف المادة الدراسية	1. Understanding the definition of entropy. 2. Define and extract the formula for marginal entropy for discrete random variables. 3. Define and extract the formula for conditional and joint entropy for two independent random variables. 4. Define and derive a formula for differential entropy. 5. Define the mutual information, and derive a formula for the channel capacity of AWGN, BSC and BEC. 6. Understanding the properties for groups, sub-groups, space vectors and fields. 7. Understanding the structure of several linear block codes. 8. Understanding the structure cyclic codes. 9. Testing the detection and correction capabilities for linear block codes based on syndrome table.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Ability to define entropy and its relation to information. 2. Ability to derive the formula for marginal entropy. 3. Ability to derive the formula for conditional and joint entropy. 4. Solving problems related to all entropy types. 5. Ability to derive a formula for differential entropy. 6. Define and derive formula for the channel capacity of AWGN, BSC and BEC. 7. Solving problems related channel capacity for all previous types. 8. Ability to test groups, sub-groups and fields. 9. Ability to construct the generator matrix in systematic form for linear block codes. 10. Construct the parity-check matrix and syndrome array or table that used for decoding. 11. Testing the error-detection and error-correction capabilities for linear block codes based on hamming distance. 12. Ability to extract the cyclic code features from its generator polynomial. 13. Extracting syndrome polynomial table, generator matrix and parity check matrix from generator polynomial of cyclic codes. 14. Features and construction of hamming codes. 15. Features and construction of BCH codes.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Entropy</u> Entropy types – the relation between information and entropy will be explained. The derivation for marginal entropy of discrete random variable is presented. The

conditional as well as the joint entropy for two independent random variables is derived. Examples for calculation of these different entropy types will be achieved. [6 hrs]

Deferential entropy and channel capacity – the formula and features for differential entropy for continuous random variable is presented. Definition for mutual information between two random variables is derived. The definition and formula for AWGN, BSC and BEC is derived with examples. [8 hrs]

Part B – fields
Definition of groups, sub-groups, vector space and their properties with examples.
 [6 hrs]
Definition of Fields sub-groups and their properties with examples. [6 hrs]

Part C – linear block codes
Generator matrix--The features and dimension for the generator matrix of linear block code and its equivalent. [6 hrs].
Parity check matrix—constructing the parity check matrix and the definition of the dual code.[6 hrs]
Error-detection and correction capabilities—based on hamming distance, extract the ability for detection and correcting errors aided by the syndrome table. [6 hrs]
Part D – Cyclic codes
Generator polynomial—represent each code as a polynomial. Extract the generator polynomial and encoding and decoding of cyclic codes using syndrome polynomials.
 [8 hrs]
 Part D – examples for well-known codes
All features related to generator matrix and relation between the length of data word and the length of code word as well as the decoding process for Hamming code and BCH codes will be presented. [8 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The course presents detail and condense lectures about an important topic in digital communication. The basic definitions for information and different types of entropy. The basic knowledge about information theory is presented in the first seven weeks while the rest weeks will be focused on coding theory. An evaluation for the students' performance will done through daily oral exams and monthly written one. The bulk marks will be dedicated for the midterm and final exam. The students will asked to prepare a seminars for a topics related to the information and coding theory,

<table>
<tr><td colspan="4" align="center">**Student Workload (SWL)**</td></tr>
<tr><td colspan="4" align="center">الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr>
<td>**Structured SWL (h/sem)**
الحمل الدراسي المنتظم للطالب خلال الفصل</td>
<td>63</td>
<td>**Structured SWL (h/w)**
الحمل الدراسي المنتظم للطالب أسبوعيا</td>
<td>4</td>
</tr>
<tr>
<td>**Unstructured SWL (h/sem)**
الحمل الدراسي غير المنتظم للطالب خلال الفصل</td>
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<td>**Unstructured SWL (h/w)**
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<tr>
<td>**Total SWL (h/sem)**
الحمل الدراسي الكلي للطالب خلال الفصل</td>
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<table>
<tr><td colspan="6" align="center">**Module Evaluation**</td></tr>
<tr><td colspan="6" align="center">تقييم المادة الدراسية</td></tr>
<tr>
<td></td>
<td></td>
<td>**Time/Number**</td>
<td>**Weight (Marks)**</td>
<td>**Week Due**</td>
<td>**Relevant Learning Outcome**</td>
</tr>
<tr>
<td rowspan="4">**Formative assessment**</td>
<td>**Quizzes**</td>
<td>2</td>
<td>10% (10)</td>
<td>5 and 10</td>
<td>LO #1, #2 and #10, #11</td>
</tr>
<tr>
<td>**Assignments**</td>
<td>2</td>
<td>10% (10)</td>
<td>2 and 12</td>
<td>LO #3, #4 and #6, #7</td>
</tr>
<tr>
<td>**Projects / Lab.**</td>
<td>1</td>
<td>10% (10)</td>
<td>Continuous</td>
<td>All</td>
</tr>
<tr>
<td>**Report**</td>
<td>1</td>
<td>10% (10)</td>
<td>13</td>
<td>LO #5, #8 and #10</td>
</tr>
<tr>
<td rowspan="2">**Summative assessment**</td>
<td>**Midterm Exam**</td>
<td>2hr</td>
<td>10% (10)</td>
<td>7</td>
<td>LO #1 - #7</td>
</tr>
<tr>
<td>**Final Exam**</td>
<td>3hr</td>
<td>50% (50)</td>
<td>16</td>
<td>All</td>
</tr>
<tr>
<td colspan="2">**Total assessment**</td>
<td colspan="2" align="center">100% (100 Marks)</td>
<td></td>
<td></td>
</tr>
</table>

<table>
<tr><td colspan="2" align="center">**Delivery Plan (Weekly Syllabus)**</td></tr>
<tr><td colspan="2" align="center">المنهاج الاسبوعي النظري</td></tr>
<tr><td></td><td>**Material Covered**</td></tr>
<tr><td>**Week 1**</td><td>Introduction –the concept of entropy for discrete random variables</td></tr>
<tr><td>**Week 2**</td><td>Formula for marginal entropy for discrete random variables with mathematical examples</td></tr>
<tr><td>**Week 3**</td><td>Formula for conditional and joint entropy for two independent random variables with mathematical examples</td></tr>
<tr><td>**Week 4**</td><td>Definition of differential entropy for continuous random variables</td></tr>
<tr><td>**Week 5**</td><td>Definition and formula for mutual information</td></tr>
<tr><td>**Week 6**</td><td>Derivation for channel capacity for AWGN, BSC and BEC.</td></tr>
<tr><td>**Week 7**</td><td>Mid-term Exam</td></tr>
<tr><td>**Week 8**</td><td>Definition of group, sub-group, vector space, and fields</td></tr>
</table>

Week 9	Generator matrix and properties of linear block codes
Week 10	Generator matrix for the dual codes, definition of parity-check matrix
Week 11	Decoding process using syndrome array and syndrome table using error detection and error correction capabilities based on hamming distance.
Week 12	The generator polynomial properties for cyclic codes
Week 13	Extraction of parity check polynomial from generator polynomial and decoding using syndrome polynomials.
Week 14	Features of Hamming codes
Week 15	Features of BCH codes
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Proakis, John G. *Digital communications*. McGraw-Hill, Higher Education, 2008.	Yes
Recommended Texts	Module lecture notes	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	**Numerical Analysis**		**Module Delivery**	
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**NUA6**			
ECTS Credits	**5.00**			
SWL (hr/sem)	**125**			
Module Level	3	**Semester of Delivery**		6
Administering Department	MCCE	**College**	COE	
Module Leader	Ola Adel Qasim	**e-mail**	ola.adel@uoitc.edu.iq	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail	
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mathematics II (MAT2)	**Semester**	2
Co-requisites module	None	**Semester**	

	Module Aims, Learning Outcomes and Indicative Contents
	أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية
Module Objectives أهداف المادة الدراسية	1. This course contains the concepts of numerical method techniques for solving linear and nonlinear equations, interpolation and regression, differentiation and integration, and partial differential equations. 2. This course is designed to achieve the following objectives: 3. To provide the numerical methods of solving the non-linear equations, interpolation, differentiation, and integration. To improve the student's skills in numerical methods by using the numerical analysis software and computer facilities. 4. The objectives of studying this module are to make the students familiarize with the ways of solving complicated mathematical problems numerically. 5. To help you become familiar with MATLAB and other convenient numerical software such as Microsoft Excel and with simple programming. 6. Obtaining numerical solutions to problems of mathematics. 7. Describing and understanding of the several errors and approximation in numerical methods. 8. The understanding of several available Solutions of Equations in One Variable. 9. The explaining and understanding of the several available methods to Solve the simultaneous equations. 10. The studying of Curve Fitting and Interpolation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course student will: 1. Acquire basic knowledge in solving interpolation with equal interval problems by various numerical methods. Estimate the missing terms through interpolation methods. 2. Develop skills in analyzing the methods of interpolating a given data, properties of interpolation with unequal intervals and derive conclusions, approximate a function using an appropriate numerical method. Implement numerical methods for a variety of multidisciplinary applications and a variety of numerical algorithms using appropriate technology. 3. Use relevant numerical techniques for interpolation with equal and unequal intervals by using various central difference formulae and code a numerical method in a modern computer language. 4. Apply appropriate numerical methods to solve the problem with most accuracy. 5. Be able to derive Least – Squares curve fitting procedures, fitting a straight line, fitting a parabola, nonlinear curve fitting, Curve fitting by a sum of exponentials. 6. Be able to find the derivatives using Newton's forward difference formula, Newton's backward difference formula, Derivatives using central difference formulae, Stirling's interpolation formula, Newton's divided difference formula, Maximum and minimum values of a tabulated function. 7. Be able to derive Trapozoidal rule, Simpson's 1/3 – rule, Simpson's 3/8 – rule, and Weddle's rules from General Quadrature formula and find the Euler – Maclaurin Formula of summation and The Euler transformation.

	8. Be able to find the solution of linear systems by using Direct methods, Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method, Method of factorization, Solution of Tridiagonal Systems,.
	9. Be able to find the find the solution of ordinary differential equation of first order by Euler, Taylor and Runge-Kutta methods.
	10. Compare different methods in numerical analysis with accuracy and efficiency of solution

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Course Contents:** **Course title: Numerical Analysis** **Chapter 1** Errors, different type of errors. Representation of numbers in computer, computer arithmetic, zero in floating point number. [5 hrs] **Chapter 2** Operators –finite differences, average, differential, etc., their inter-relations. Difference of polynomials. Difference equation. Interpolation. Lagrange's methods, error terms. Uniqueness of interpolating polynomial. Newton's fundamental interpolation. Forward, backward and central difference interpolations. Interpolation by iteration. Spline interpolation, comparison with Newton's interpolation. Hermite's interpolation. Bivariate interpolation, Lagrange and Newton's methods. Inverse interpolation. [10 hrs] **Chapter 3** Approximation of function. Least square method. Use of orthogonal polynomials. Approximation by Chebyshev polynomials, Max-min principle. Economization of power series. [5 hrs] **Chapter 4** Solution of non-linear equation containing one variable. Newton's methods. Modified Newton-Raphson method. Birge-Vieta method, Bairstow method. System of non-linear equations-iteration and Newton-Raphson methods. [10 hrs] **Chapter 5** System of linear equations. Iteration methods, rate of convergence. Matrix factorization methods. Tridiagonal equations. Least square method for inconsistent system. Ill conditioned systems. Relaxation method. [10 hrs] **Chapter 6** Eigenvalues and eigenvectors of matrix. Leverrier-Faddeev method. Power method. Jacobi's method, Givens method, Householder's method. Comparisons. [5 hrs] **Chapter 7** Differentiation. Lagrange's method. Gauss-quadrature. Degree of precision. Gauss-Legendre and Gauss-Chebyshev methods. Double integration. Monte-Carlo method. [10 hrs] **Chapter 8** Ordinary differential equation. Euler's method. Runge-Kutta methods. Predictor-corrector method. Finite-difference method. IVP and BVP. Shooting method. Stability analysis. [10 hrs] **Chapter 9** Partial differential equation. Finite-difference approximation. Explicit methods. Crank-Nivolson method. Parabolic, hyperbolic and elliptic equation. Stability. [10 hrs] **Laboratory Works:**

	The laboratory exercise should consist program development and testing of non-linear equations, system of linear equations, interpolation, numerical integration and differentation, linear algebraic equations, ordinary and partial differential equations. Numerical solutions using C or Matlab.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	✔ The use of explanation by the subject teacher on the white board and the digital display screen (data show) connected to the computer, the use of software, pictorial, video and audio presentation tools, and the discussion of scientific ideas and vocabulary with students.
	✔ Evaluation methods will depend on (daily exams, monthly exams, semester exams, oral exams, reports, research and extra-curricular activities).
	✔ The emotional and value goals will depend on the theoretical materials simulating the students' feeling of familiarity with the cognitive aspects and how to apply them practically, raising the cognitive values of the study materials through practical application, raising the students' efficiency and teaching capabilities in their lessons, and raising the students' emotional aspects through holding competitions, as well as a sense of responsibility towards others.
	✔ Teaching and learning methods will depend on (through theoretical teaching by the subject teacher, by setting up groups to perform homework, by setting up extra-curricular activities, by participating in lessons and software programs on the Internet, and by presenting intellectual products to students).
	✔ Evaluation methods will depend on the following (through theoretical and oral examinations, evaluation of students' performance through classroom and extra-curricular activities, evaluation by involving students in solving problems in front of others, during which the student's awareness of his moral and scientific responsibility is evaluated.
	✔ Transferred general and qualifying skills (other skills related to employability and personal development). Providing students with general knowledge in numerical analysis, applying what students have gained from knowledge in numerical analysis in many areas of their specialization. The ability to work effectively within a team to accomplish a specific task.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3

Total SWL (h/sem)	125
الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Error in Numerical Computations. Propagation of Errors and Computer Arithmetic.
Week 2	Operators in Numerical Analysis. Lagrange's. Interpolation. Newton's Interpolation Methods. Central Deference Interpolation Formulae.
Week 3	Aitken's and Hermite's Interpolation Methods. Spline Interpolation. Inverse Interpolation. Bivariate Interpolation.
Week 4	Least Squares Method. Approximation of Function by Least Squares Method. Approximation of Function by Chebyshev Polynomials.
Week 5	Newton's Method to Solve Transcendental Equation. Roots of a Polynomial Equation. Solution of System of Non-linear Equations.
Week 6	Matrix Inverse Method. Iteration Methods to Solve System of Linear Equations. Methods of Matrix Factorization.

Week 7	Mid tem Exam (1)
Week 8	Gauss Elimination Method and Tridiagonal Equations. Generalized Inverse of Matrix. Solution of Inconsistent and Ill Conditioned Systems.
Week 9	Construction of Characteristic Equation of a Matrix. Eigenvalue and Eigenvector of Arbitrary Matrices. Eigenvalues and Eigenvectors of Symmetric Matrices.
Week 10	Numerical Differentiation. Newton-Cotes Quadrature.
Week 11	Gaussian Quadrature. Monte-Carlo Method and Double Integration.
Week 12	Runge-Kutta Methods. Predictor-Corrector Methods.
Week 13	Finite Difference Method and its Stability. Shooting Method and Stability Analysis.
Week 14	Partial Differential Equation: Parabolic. Partial Differential Equations: Hyperbolic.
Week 15	Partial Differential Equations: Elliptic. REVISION, ASSESSMENT and EVALUATION WEEK
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: TO FIND THE ROOTS OF NON-LINEAR EQUATION USING BISECTION METHOD.
Week 2	Lab 2: TO FIND THE ROOTS OF NON-LINEAR EQUATION USING NEWTON'S METHOD.
Week 3	Lab 3: CURVE FITTING BY LEAST – SQUARE APPROXIMATIONS.
Week 4	Lab 4: TO SOLVE THE SYSTEM OF LINEAR EQUATIONS USING GAUSS - ELIMINATION METHOD.
Week 5	Lab 5: TO SOLVE THE SYSTEM OF LINEAR EQUATIONS USING GAUSS - SEIDAL ITERATION METHOD.
Week 6	Lab 6: TO SOLVE THE SYSTEM OF LINEAR EQUATIONS USING GAUSS - JORDEN METHOD.
Week 7	Lab 7: TO INTEGRATE NUMERICALLY USING TRAPEZOIDAL RULE.
Week 8	Lab 8: TO INTEGRATE NUMERICALLY USING SIMPSON'S RULES.
Week 9	Lab 9: TO FIND THE LARGEST EIGEN VALUE OF A MATRIX BY POWER - METHOD.
Week 10	TO FIND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS BY EULER'S METHOD.
Week 11	TO FIND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS BY RUNGE- KUTTA METHOD.
Week 12	TO FIND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS BY MILNE'S METHOD.
Week 13	TO FIND THE NUMERICAL SOLUTION OF LAPLACE EQUATION.
Week 14	TO FIND THE NUMERICAL SOLUTION OF WAVE EQUATION.
Week 15	TO FIND THE NUMERICAL SOLUTION OF HEAT EQUATION.

	Learning and Teaching Resources	
	مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	1-W. Chency and D. Kincaid, "Numerical Mathematics and Computing", 7thEdition, Brooks/Cole Publishing Co, 2012 2-C.F. Gerald and P.O. Wheatley, "Applied Numerical Analysis", 9th Edition, Addison Wesley Publishing Company, New York, 2011. 3-E. Balagurusamy, "Numerical Methods", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1999 4-W.H. Press, B.P. Flannery et al., "Numerical Recipes: Art of Scientific Computing", 3rd Edition, Cambridge Press, 2007. 5-J. M. Mathews and K. Fink, "Numerical Methods using MATLAB ", 4rd Edition, Prentice Hall Publication, 2004.	No
Recommended Texts	1-Basic lectures prepared by the teacher	Yes
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
	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	**Space Science II**		**Module Delivery**	
Module Type	**Elective**		☒ Theory	
Module Code	**SSC6**		☐ Lecture	
ECTS Credits	**3.0**		☐ Lab	
SWL (hr/sem)	**75**		☐ Tutorial ☐ Practical ☐ Seminar	
Module Level	3	**Semester of Delivery**		6
Administering Department	MCCE	**College**	COE	
Module Leader	Firas Ayad	**e-mail**	firas.ayad@uoitc.edu.com	
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**		M.Sc.
Module Tutor	Name (if available)	**e-mail**	E-mail	
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0	

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	Space science I (SSC5)	**Semester**	5
Co-requisites module		**Semester**	

	Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To gain an in-depth understanding of satellite communication systems, including their design, operation, and applications. 2. To develop proficiency in analyzing and designing orbital trajectories, considering factors such as launch mechanics, orbit transfer, and orbital maintenance. 3. To explore the impacts of space weather on communication systems and satellite operations, and learn methods to mitigate their effects. 4. To study advanced remote sensing techniques, including the principles behind satellite imagery, data acquisition, and analysis. 5. To enhance problem-solving skills through practical applications of space science concepts in the field of communications engineering.	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a comprehensive understanding of satellite communication systems, including their design, operation, and applications. 2. Apply principles of orbital mechanics to analyze and design orbital trajectories, considering factors such as launch mechanics, orbit transfer, and orbital maintenance. 3. Assess the impacts of space weather on communication systems and satellite operations, and implement strategies to mitigate their effects. 4. Utilize advanced remote sensing techniques, including satellite imagery, data acquisition, and analysis, to address communication engineering challenges. 5. Apply problem-solving skills to practical applications of space science concepts in the field of communications engineering. 6. Evaluate the performance of satellite communication systems, considering factors such as link budgets, frequency bands, and satellite constellations. 7. Analyze and interpret space weather data to make informed decisions regarding communication system operations and performance. 8. Demonstrate proficiency in using remote sensing techniques for various applications, such as environmental monitoring and disaster management. 9. Communicate effectively, both orally and in writing, on complex topics related to space science and its applications in communications engineering. 10. Collaborate with peers to solve problems and engage in discussions related to satellite communication systems, orbital mechanics, space weather, and remote sensing techniques.	

Indicative Contents
 	
المحتويات الإرشادية
	Indicative content includes the following.
	
	1. Introduction to Satellite Communication Systems
	   ● Principles and components of satellite communication systems
	   ● Frequency bands and link budgets
	   ● Satellite orbits and constellations. [9 hrs]
	2. Orbital Mechanics
	   ● Kepler's laws of planetary motion
	   ● Launch mechanics and rocket propulsion	

- Orbital elements and ground track prediction
- Orbit transfer and orbital maneuvering. [9 hrs]

3. Space Weather and its Impact on Communication Systems
   - Solar activity and its effects on the Earth's ionosphere
   - Ionospheric scintillation and its impact on satellite communication
   - Space weather forecasting and mitigation strategies. [9 hrs]

4. Remote Sensing Techniques
   - Introduction to remote sensing and satellite imagery
   - Data acquisition and processing techniques
   - Applications of remote sensing in communication engineering. [9 hrs]

5. Practical Applications and Case Studies
   - Designing and analyzing satellite communication systems
   - Simulating orbital mechanics and trajectory planning
   - Analyzing space weather data and its effects on communication links. [9 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Space Science II is a course designed for students in the Communications Engineering class. It serves as a continuation of the Space Science I course, providing advanced knowledge and understanding of key concepts in the field of space science and its applications. The course focuses on exploring various aspects of space science, including satellite communication systems, orbital mechanics, space weather, and remote sensing techniques.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Satellite Communication Systems
Week 2	Kepler's Laws and Orbit Mechanics
Week 3	Launch Mechanics and Orbit Transfers
Week 4	Orbital Maneuvers and Station keeping
Week 5	Space Weather Fundamentals
Week 6	Space Weather Mitigation Strategies
Week 7	Introduction to Remote Sensing
Week 8	Satellite Image Acquisition and Processing
Week 9	Image Analysis and Classification
Week 10	Applications of Remote Sensing in Communication Engineering
Week 11	Advanced Satellite Communication Systems
Week 12	Satellite Antenna Systems
Week 13	Satellite Network Design and Performance Evaluation
Week 14	Satellite Communication Protocols
Week 15	Emerging Trends in Space Science and Communications
Week 16	Review and Assessment Preparation

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Satellite Communications Systems: Systems, Techniques and Technology" by Gerard Maral, Michel Bousquet, and Zhili Sun	No
Recommended Texts	"Remote Sensing and Image Interpretation" by Thomas Lillesand, Ralph W. Kiefer, and Jonathan Chipman	No
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	**Wireless Communication Networks**	**Module Delivery**
Module Type	**Core**	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	**WCN6**	
ECTS Credits	**5.0**	
SWL (hr/sem)	**125**	

Module Level	3	Semester of Delivery		6
Administering Department	MCCE	**College**	COE	
Module Leader	Yaseen Naser Jurn	**e-mail**	Yaseen.naser@uoitc.edu.iq	
Module Leader's Acad. Title	Dr. Lect.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail	
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Digital Communication (DCM5)s	**Semester**	5
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of wireless sensors network through the application of techniques. 2. To understand protocols and algorithms of this type of network. 3. This course deals with the basic concept of Node Architecture. 4. Understanding Application of LEACH Protocol. 5. This is the basic subject for different laws and equations of Energy consumption of sensor nodes. 6. To understand Node and Network Management. 7. To understand the Basic Architectural Framework.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Understanding the basic concepts of designing the wireless sensor network . 2. Recognize different types of sensor node prototypes. 3. Study the Maximum Lifetime Scheduling in Wireless Sensor Networks. 4. Summarized the energy conception analysis of sensor nodes. 5. Define and explain the Protocols and algorithms of wireless sensor networks. 6. Define and explain the basics of Time Synchronization. 7. Discuss the principles of Localization. 8. Discuss the security of the network. 9. Summarized the Power Management and Local Power Management. 10. Identification of Source Encoding and Channel Encoding. 11. Discuss the Clocks and the Synchronization Problem.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part 1: Overview of Wireless Sensor Network and its Applications In this part the Structure of a wireless sensor network, Structure of a node of Wireless Sensor Network are discussed. The Energy consumption issues in wireless sensor networks are studied . [10 hrs] Part 2: Protocols & algorithms of wireless sensor network In this part, the study of important protocols and algorithms are presented such as; Flooding & Gossiping and Sensor Protocols for Information via Negotiation (SPIN), Low-Energy Adaptive Clustering Hierarchy (LEACH), Cartesian Coordinates, Cylindrical Coordinates, Spherical Coordinates, Transformation between coordinates systems. Maximum Lifetime Scheduling in Wireless Sensor Networks- Coverage problems, The basic algorithm [20 hrs] part 3: Node Architecture – Prototypes: There are two types of node architecture presented for hardware application, these types are: IMote Node Architecture, The XYZ Node Architecture. Basic Architectural Framework- Source Encoding, Channel Encoding,- Wireless MAC Protocols,

	Contention-Free MAC Protocols - Contention-Based MAC Protocols, Hybrid MAC Protocols, Network Layer, Routing Metrics [15 hrs] part 4: localization of Node and programming in this part: the localization and programming of node are presented Localization- Ranging Techniques, Range-Based Localization, Range-Free Localization. Sensor Network Programming, Challenges in Sensor Network Programming. - Node-Centric Programming, Macro programming, - Dynamic Reprogramming. [15 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The student must attend this module to get the basic information about his specialization. The lecture notes will be given in parallel with the experimental lab. The progress in understanding the giving lectures will be tested through daily oral exams and monthly written one. Additional homework is required to solve the mathematical problems in each topic. The main evaluation will be on the midterm exams which is planned to be two in this module.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10

Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Overview of Wireless Sensor Network
Week 2	Protocols & algorithms of wireless sensor network
Week 3	Maximum Lifetime Scheduling in Wireless Sensor Networks
Week 4	Node Architecture
Week 5	Operating Systems
Week 6	Basic Architectural Framework
Week 7	Contention-Free MAC Protocols
Week 8	Node and Network Management
Week 9	Time Synchronization
Week 10	Localization
Week 11	Security
Week 12	Sensor Network Programming
Week 13	The steady Magnetic Field, Biot-Savart Law
Week 14	Ampere's Circuital Law, Ampere's Law Applied to a Long Wire, Curl of Vector Field, Magnetic Flux and Flux Density
Week 15	LEACH Protocol
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Design of simple WSN
Week 2	Lab 2: Energy-Efficient Protocols In Wireless Sensor Networks
Week 3	Lab 3: Coverage problem
Week 4	Lab 4: Sensing positing data using GPS and transmitting it

Week 5	Lab 5: LEACH & SPIN protocol simulation
Week 6	Lab 6: Energy consumption model
Week 7	Lab 7: Communication links

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Overview of Wireless Sensor Network, 2012. licensee InTech	Yes
Recommended Texts	Wireless Sensor Networks - Design, Deployment and Applications, 2021	No
Websites	https://encyclopedia.pub/entry/17294	

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.

المرحلة: الرابعة
الفصل الدراسي: السابع

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center"><b style="color:red">Embedded Systems</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Elective</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center"><b style="color:red">EDS7</td></tr>
<tr><td>ECTS Credits</td><td align="center">5.00</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center"><b style="color:red">125</td></tr>
<tr><td>Module Level</td><td>4</td><td>Semester of Delivery</td><td>7</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td>COE</td></tr>
<tr><td>Module Leader</td><td>Ibrahim Abbas Ameen</td><td>e-mail</td><td>Ibrahim.ameen@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Assistant Lecturer</td><td>Module Leader's Qualification</td><td>M.Sc.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td></td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td>1.0</td></tr>
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<table>
<tr><td colspan="4" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Microprocessor (MPS4)+Electrical circuits I (ECT1)</td><td>Semester</td><td>4+1</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1- Fundamentals of Embedded Systems: The subject introduces students to the basic concepts and principles of embedded systems. This includes understanding the hardware-software interaction, real-time constraints, and the design considerations involved in developing embedded systems. 2- Microcontroller/Microprocessor Architecture: Students learn about the architecture, components, and functionalities of microcontrollers or microprocessors commonly used in embedded systems. This involves studying the processor core, memory organization, input/output interfaces, and various peripherals. 3- Programming for Embedded Systems: This objective focuses on developing programming skills specific to embedded systems. Students learn how to write efficient, low-level code in languages such as C, C++ or Arduino languages, understand memory management, and utilize hardware resources effectively. 4- Embedded Systems Design and Development: The subject covers the methodologies and tools used in designing and developing embedded systems. Students learn about system-level design, hardware-software co-design, interface protocols, and techniques for testing and debugging embedded systems. 5- Peripherals and Interfacing: This objective focuses on understanding how embedded systems interact with external devices and sensors. Students learn about different communication protocols (e.g., UART, SPI, I2C) and how to interface with peripherals such as displays, sensors, motors, and networking components. 6- Embedded Systems Applications: The subject may explore various practical applications of embedded systems, such as robotics, automotive systems, consumer electronics, medical devices, industrial control systems, and Internet of Things (IoT) devices. Students may gain insights into the design considerations and challenges specific to these domains.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Understand the fundamental concepts and principles of embedded systems, including the hardware-software interaction, real-time constraints, and design considerations. 2. Demonstrate knowledge of microcontroller/microprocessor architecture, including the processor core, memory organization, and input/output interfaces. 3. Develop programming skills specific to embedded systems, including writing efficient, low-level code in languages such as C or assembly language, and understanding memory management. 4. Apply design methodologies and tools for developing embedded systems, including system-level design, hardware-software co-design, and techniques

	for testing and debugging.
	5. Demonstrate an understanding of real-time operating systems (RTOS), including task scheduling, interrupt handling, synchronization, and communication mechanisms.
	6. Design and implement interfaces between embedded systems and external devices or peripherals, utilizing various communication protocols and techniques.
	7. Analyze and solve problems related to embedded systems design, implementation, and performance optimization.
	8. Demonstrate effective communication and teamwork skills in the context of embedded systems development.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – General Embedded Systems (Arduino as example) Introduction about embedded systems in general (the main components of embedded systems, understand the differences among digital system diagrams) and Arduino UNO board (study the overall components of the boards and its properties). Arduino libraries(study the library types and How to install them in Arduino IDE). [15 hrs] Studying the Arduino UNO board's pins. The Digital and the analog pins. By this we study in depth the properties of the digital pins and how to use them as input pins or as output pins. Also we study the analog pins of the board and know how to use them as input and as output pins and what are the limitations of each choice [10 hrs] Learn about the development boards processor types, contents, and architectures. To understand what are the internal components of the microprocessor which is inside the microcontroller and know each component properties and limitations. Also learn about the memory types that used in inside the embedded systems to why we use each of them and when [10 hrs] Part B – Embedded systems applications and practices Learn about timers types and functions and about interrupts types and how to use them. This is a very important topic to understand and use embedded systems timers and interrupts. This will lead to enhance the use of embedded system functionality and make it useful for more complicated projects [10 hrs] Learn about embedded systems' wired and wireless communications protocols. The wired serial communication protocols (I2C, UART, USART, SPI) are very important to secure a wired communication between Arduino board and other modules, sensors, and actuators. The wireless communication protocols are (Wifi, Bluetooth, Zigbee, RF modules). These protocols are useful to make the development board communicates wirelessly with other boards, modules, cloud which boost the quality and the usage of the embedded systems [30 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1- Lectures: Theoretical concepts and foundational knowledge are delivered through instructor-led lectures, using visual aids and examples. 2- Laboratory Work: Hands-on practical sessions allow students to apply theoretical knowledge by working with microcontrollers, writing code, and implementing small projects. 3- Group Projects: Collaborative projects encourage teamwork, problem-solving, and communication skills, involving the design and implementation of embedded systems. 4- Case Studies: Real-world examples of embedded systems are analyzed to understand design considerations, challenges, and solutions in different industries. 5- Simulations and Virtual Labs: Virtual tools provide students with simulated hardware environments to practice and experiment with embedded systems concepts. 6- Assessment Methods: Various assessment methods, including exams, quizzes, projects, and presentations, evaluate students' theoretical understanding and practical skills. 7- Continuous Feedback and Support: Instructors provide regular feedback and guidance to help students improve their understanding and skills in embedded systems.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7

4

		1	10% (10)	Continuous	All
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction about Embedded Systems and Arduino
Week 2	The Basic Functions in Arduino language
Week 3	Arduino Libraries
Week 4	Arduino board- Digital input/output
Week 5	Arduino board- Analog input/output
Week 6	Development board Processors (Architectures)
Week 7	Memory Systems
Week 8	Mid-term Exam
Week 9	Timers and Interrupts
Week 10	Timers and Interrupts
Week 11	Serial Communication Protocols (UART, USART, I2C, and SPI)
Week 12	Arduino Wireless Communications (Wi-Fi)
Week 13	Arduino Wireless Communications (RF-Modules)
Week 14	Arduino Wireless Communications- (Bluetooth)
Week 15	Arduino Wireless Communications-(ZigBee)
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Arduino with LEDs
Week 2	Lab 2: Arduino with Switches
Week 3	Lab 3: Arduino with Keypad

Week 4	Lab 4: Arduino-Analog Input/output
Week 5	Lab 5: Display Using LCD Screen
Week 6	Lab 6: Display Using 7-Segment
Week 7	Lab 7: Arduino with Sensors (Ultrasonic sensor)
Week 8	Lab 8: Mini-project -Car reverse parking system
Week 9	Lab 9: Mini-Project-Security system/ Motion detection on a main door
Week 10	Lab 10: Mini-Project-Two Arduino boards communicate via I2C protocol
Week 11	Lab 11: Mini-Project-Daylight identifier system/Servo motor & light sensor
Week 12	Lab 12: Mini-Project-Controlling speed & direction of stepper motor
Week 13	Lab 13: IR obstacle avoidance & DHT22/DHT11 Sensors
Week 14	Lab 14: Mini-Project- IoT Monitoring Project/Thingspeak IoT Platform

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts	- Embedded Systems Design, Steve Heath, Second Edition, Newnes, 2002 - Introduction to Microcontrollers, Gunther Gridling and Bettina Weiss, University of Vienna - Arduino Cookbook, 2nd Edition, Michael Margolis - Embedded System Design Introduction to SoC System Architecture, Mohit Arora - Arduino Internals, Dale Wheat - Embedded Systems Architecture, Tammy Noergaard	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	**Mobile Applications**	**Module Delivery**	
Module Type	**Core**	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**MAP7**		
ECTS Credits	**6.00**		
SWL (hr/sem)	**150**		
Module Level	4	**Semester of Delivery**	7
Administering Department	MCCE	**College**	COE
Module Leader	Saba A.Tuama	**e-mail**	Saba.ayad@uoitc.edu.iq
Module Leader's Acad. Title	Lecturer Dr.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Computer Programming I (CPR2)	**Semester**	2
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To familiarize the student with the universal concepts of mobile applications. 2. To present the syntax and semantics of the mobile applications programming language as well as basic data types, offered by the language. 3. To demonstrate the means useful in resolving typical implementation problems with the help of standard language libraries.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Discuss the modern mobile operating platforms and their operating systems. 2. Recognize how to evolute of modern mobile operating platforms and their operating systems . 3. Gain the knowledge in the field of programming languages to create mobile applications. 4. Create a mobile application using the Swift programming language 5. Debug a mobile application written in the Swift programming language. 6. Test a mobile application written in the Swift programming language.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: ▪ **Overview of Mobile Applications** Mobile applications challenges, Android mobile applications, IOS mobile applications, Swift language. [5h] ▪ **Introduction to Swift** Overview, Environment, Basic Syntax, Data Types, Variables [4h] ▪ **Optional, Constant, and Operators** Optional, Tuples, Constants, Literals, Operators [4h] ▪ **Condition Statement** If Statement, If …. Else statement, Nested if statement, Switch statement [8h] ▪ **For Loop and Control Statements** For loop repetition, nested for loop, Break and continue statement [8h]. While repetition, Do/white repetition [8h] ▪ **Strings and Characters** Strings, String library and standard functions, Read/Write Strings, Characters manipulation [8h] ▪ **Array** Array declaration, initializing array, Read, Write and Process array [6h]. Multi-dimensional array declaration, Processing 2D array elements. [8h] ▪ **Functions** Introduction for functions, Return statement, Types of functions. [8h] ▪ **Structures** Define structure, Initialize a structure. [8h].

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Interactive lectures will be conducted to introduce notions and techniques used in mobile application programming. 2. Laboratory Sessions: Hands-on laboratory experiments will provide practical experience in syntax and semantics of the mobile applications programming language. 3. Case Studies: Real-world case studies will be presented to illustrate the relevance of mobile application designing and programming to solve various problems. 4. Assignments and Assessments: Assignments and assessments will be given to assess students' understanding and application of mobile application concepts.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

<table>
<tr><td colspan="2">Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري</td></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Overview of Mobile Applications</td></tr>
<tr><td>Week 2</td><td>Introduction to Swift</td></tr>
<tr><td>Week 3</td><td>Optional, Constant, and Operators</td></tr>
<tr><td>Week 4</td><td>Condition Statement - If Statement</td></tr>
<tr><td>Week 5</td><td>Condition Statement - Switch Statement</td></tr>
<tr><td>Week 6</td><td>For Loop and Control Statements</td></tr>
<tr><td>Week 7</td><td>Mid-term Exam (1)</td></tr>
<tr><td>Week 8</td><td>Loop Iteration Statement - While repetition - Do/white repetition</td></tr>
<tr><td>Week 9</td><td>Strings and Characters</td></tr>
<tr><td>Week 10</td><td>Array - Array declaration - Initializing array</td></tr>
<tr><td>Week 11</td><td>Read, Write and Process array</td></tr>
<tr><td>Week 12</td><td>Multi-dimensional Array</td></tr>
<tr><td>Week 13</td><td>Functions - Introduction for functions - Return statement - Types of functions</td></tr>
<tr><td>Week 14</td><td>Structures - Define structure. - Initialize a structure.</td></tr>
<tr><td>Week 15</td><td>Mid-term Exam (2)</td></tr>
<tr><td>Week 16</td><td>Preparatory week before the final Exam</td></tr>
</table>

<table>
<tr><td colspan="2">Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر</td></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Lab 1: - Show samples of mobile applications - Show samples of codes.</td></tr>
<tr><td>Week 2</td><td>Lab 2: - Write a program to define variables and applied the basic arithmetic and mathematic operations on them.
- Write a simple program to read and print variable on the screen</td></tr>
<tr><td>Week 3</td><td>Lab 3: -Write if statement program.
- Write a simple multi-choices program.</td></tr>
<tr><td>Week 4</td><td>Lab 4: - Write control statement programs</td></tr>
<tr><td>Week 5</td><td>Lab 5: - Write repetition programs</td></tr>
<tr><td>Week 6</td><td>Lab 6: - Write a program to read and print string
- Write characters manipulation program</td></tr>
</table>

Week 7	Lab 7: - Write a program to initialize an array then fill the array with user input and print the array elements
Week 8	Lab 8: - Write a program to initialize a 2D array then fill the array with user input and print the array elements
Week 9	Lab 9:- - Write a program that calls function
Week 10	Lab 10: - Write a program that contains structure.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Swift Programming: The Big Nerd Ranch Guide (2nd Edition). by Matthew Mathias and John Gallagher	Yes
Recommended Texts	Learning Swift: Building Apps for macOS, iOS, and Beyond 2nd Edition. by Paris Buttfield-Addison, Jonathon Manning, and Tim Nugent.	No
Websites	https://www.coursera.org/learn/android-programming	

Grading Scheme
مخطط الدرجات

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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
	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

<table>
<tr><td colspan="5" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2" align="center">Mobile Communications I</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2" align="center">Core</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2" align="center">MCM7</td></tr>
<tr><td>ECTS Credits</td><td colspan="2" align="center">6.0</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2" align="center">150</td></tr>
<tr><td>Module Level</td><td>4</td><td>Semester of Delivery</td><td colspan="2">7</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td colspan="2">COE</td></tr>
<tr><td>Module Leader</td><td>Mohammed Khudhair Abbas</td><td>e-mail</td><td colspan="2">mohammed.abbas@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Asst. Lec.</td><td>Module Leader's Qualification</td><td colspan="2">MS.C.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td colspan="2">1.0</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Communication Fundamentals (CMF4)</td><td>Semester</td><td>4</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

	Module Aims, Learning Outcomes and Indicative Contents
	أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية
Module Objectives أهداف المادة الدراسية	To understand the: 1. Principles of wireless and mobile communication. 2. Concepts of basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference. 3. To understand the FDMA, TDMA, spread spectrum multiple access. 4. To understand the GPRS Architecture, GPRS and packet data network, GPRS network operation and development of wireless networks
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basic concept for a mobile communication system. 2. Study and understand the cellular concept. 3. Cellular system design fundamentals. 4. Allow the students to apply channel assignment strategies. 5. Analyze and apply Mobile radio propagation. 6. Study and analyze the GSM system.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theory 1- Study the main background to Mobile Communications [5 hrs] 2- Study the Channel Assignment Strategies and give a real examples [5 hrs] 3- Study the different ways to improve the coverage area and capacity [5 hrs] 4- Present the Mobile Radio Propagation methods and real-life examples [6 hrs] 5- Introduce the Fading and define in in term of mobile network characteristics [4 hrs] 6- Analyze the reasons behind Interference and find scientific solutions to solve this crucial problem [6 hrs] 7- Define and introduce the GSM and the technique used and the effective revolution behind it [4] 8- Study the main strategies of the mobile communication security for both transferring packets and the channel [5] Part B – Practical 1- Define and introduce the 4G VoLTE Smartphone Specifications [4 hrs]. 2- Analyze the User Equipments (UE) and all its related spesefications [4 hrs] 3- Study and analyze the LTE Traffic [4 hrs] 4- Define and study the utilized antenna through the mobile communication between the communicating parties [4 hrs] 5- Study and introduce the behavior of the Transmitter, Receiver and Oscillator [4 hrs]

	Learning and Teaching Strategies
	استراتيجيات التعلم والتعليم
Strategies	Through theoretical and oral exams

	1. Evaluate students' performance through classroom and extra-curricular activities 2. Evaluation by involving students in solving problems in front of others, during which the student's awareness of his moral and scientific responsibility is evaluated. 3. Transferred general and qualifying skills (other skills related to employability and personal development). 4. Providing students with general knowledge in computing mathematics 5. Applying the knowledge gained by students in computing mathematics in many areas of their specialization. 6. The ability to work effectively within a team to accomplish a specific task.	

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of mobile communication and system design fundamentals
Week 2	Channel Assignment Strategies
Week 3	Improving coverage and capacity
Week 4	Mobile Radio Propagation and Fading
Week 5	Interference and path loss calculation
Week 6	Cellular system design fundamentals
Week 7	Mid-term Exam + Unit-Step Forcing, Forced Response, the RLC Circuit
Week 8	Introduction to multiple accesses and spread spectrum
Week 9	GSM architecture and call routing
Week 10	Public Land Mobile Network
Week 11	Trees and its Applications
Week 12	Authentication and Security
Week 13	Location Tracking and Call setup
Week 14	GPRS architecture and network operation
Week 15	Free space propagation and covered area
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to 4G LTE Smart Phone TechBook
Week 2	Lab 2: Study and observe Transmitted/Received RF signal
Week 3	Lab 3: Study and observe Transmitted (I & O) /Received (I & O) signal constellation
Week 4	Lab 4: Steady and measure Battery voltages
Week 5	Lab 5: Analyze the 'Partially ON' mode while charging 4G LTE Smart Phone TechBook
Week 6	Lab 6: Steady of switch faults in Battery section
Week 7	Lab 7: Power Management Unit

<table>
<tr><td colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Ziemer & Tranter, Principles of Communications - Systems, Modulation, and Noise, 7th edition,</td><td>Yes</td></tr>
<tr><td>Recommended Texts</td><td>Proakis & Salehi, Fundamentals of Communication Systems, 2nd edition, 2014</td><td>No</td></tr>
<tr><td>Websites</td><td colspan="2">https://academy.theiet.org/mobile-communications-full-course</td></tr>
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	Text	**Available in the Library?**
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Websites	https://academy.theiet.org/mobile-communications-full-course	

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**	**Module Delivery**	
Module Type	**Elective**	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**NTS7**		
ECTS Credits	**5.0**		
SWL (hr/sem)	**125**		
Module Level	4	**Semester of Delivery**	7
Administering Department	MCCE	**College**	COE
Module Leader	Ghada Emad Kassim	**e-mail**	ghada.emad@uoitc.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Computer Programming I (CPR2)	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. A- The course aims to explain the means and methods that must be followed to protect the computer from entry to it from unauthorized and tampering with it. 2. Protect data and databases from intruders. 3. Protecting the computer network, especially private networks, from hacker attacks by activating and invest network protection protocols to perform mesh and Nodal analysis. 4. Knowledge of the basics of information security in communications. 5. Study and analysis of symmetric encryption algorithms affine, OTP, hill cipher, Playfair, transposition... etc. 6. Study the concept of code analysis and give an example of code substitution. 7. Study and analysis of asymmetric encryption algorithms RSA.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The ability to apply knowledge in the field of network security. 2. Ability to understand encryption and the details of encryption algorithms. 3. The ability to use and apply encryption algorithms. 4. Knowledge of the basics of information security in communications. 5. Study and analysis of symmetric and asymmetric encryption algorithms. 6. Study the concept of code analysis and give an example of the code.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. cryptography algorithms ● Encryption using symmetric key [15]. ● Decryption using symmetric key [10]. ● Asymmetric encryption [15]. ● Asymmetric decryption [10]. ● Hashing [10].

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Interactive lectures will be conducted to introduce notions and techniques used in Network Security. 2. Laboratory Sessions: Hands-on laboratory experiments will provide practical experience in syntax and semantics of Network Security and cryptography algorithms. 3. Case Studies: case studies will be presented to illustrate the relevance of cryptography algorithms to solve various problems in Network Security.

	4. Assignments and Assessments: Assignments and assessments will be given to assess students' understanding and application of Network Security.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Security Fundamentals and CIA concepts.
Week 2	Security Attack, Basic Terminology, Basic Cryptographic Algorithms.
Week 3	Cryptography. Block cipher
Week 4	Cryptography. stream cipher
Week 5	Cryptography. Symmetric.

Week6	Cryptography. Asymmetric.
Week 7	Mid term
Week 8	Security Standards and Protocols.
Week 9	Cryptanalysis systems.
Week 10	Attacks on Cryptosystems.
Week 11	Virtual Private Networks (VPN).
Week 12	Intrusion detection system (IDS)
Week 13	Intrusion prevention system (IPS)
Week 14	Wireless Network Security.
Week 15	Privacy, Legal Issues and Ethics.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Examining and Implementation of a Block Cipher
Week 2	Lab 2: Examining and Implementation of a stream Cipher
Week 3	Lab 3: Implementation of stream cipher
Week 4	Lab 4: Implementation of Symmetric cipher.
Week 5	Lab 5: Implementation of Asymmetric cipher.
Week 6	Lab 6: Implementation of Privacy, Legal Issues and Ethics.
Week 7	Lab 7: Implementation of Privacy, Legal Issues and Ethics.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. William Stallings, *Cryptography and Network Security, (Principles and Practice),* 2017. 2. William Stallings, *Cryptography and Network Security, (Principles and Practice),* 2020. 3. Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan.	No
Recommended Texts	Managing Cisco Network Security: Building Rock-Solid Networks,2000.	No

Websites	1. https://www.udemy.com/courses/it-and-software/network-and-security.
	2. https://www.coursera.org/learn/-network-security.
	3. https://www.udacity.com/course/network-security--ud199.

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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Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center">Project Management</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Core</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center">PMG7</td></tr>
<tr><td>ECTS Credits</td><td align="center">4</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center">100</td></tr>
<tr><td>Module Level</td><td>4</td><td>Semester of Delivery</td><td>7</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td>COE</td></tr>
<tr><td>Module Leader</td><td>Israa Abdulameer Resen</td><td>e-mail</td><td>israa.resen@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Assistant Lecturer</td><td>Module Leader's Qualification</td><td>MS.C.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td>1.0</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Level3</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

	Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives 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. Indicative content includes the following. **Introduction of management**, main elements of project management, steps/phases of project management, Economics for the engineers [6 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 [14 hrs.] **Linear programming**: graphical method, Linear programming: simplex method [14 hrs.] **The break-even point Productivity**. [6 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 محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation				
تقييم المادة الدراسية				
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	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	Critical path method(CPM)
Week 6	Critical path method(CPM)/ Activity on arrow
Week 7	Mid-term Exam
Week 8	Critical path method(CPM)/ Activity on node
Week 9	Pert technique(Time-Cost)
Week 10	Project crashing
Week 11	Linear programming: graphical method
Week 12	Linear programming: simplex method
Week 13	The break-even point
Week 14	Inventory models
Week 15	Productivity
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab.1: Introduction to Microsoft Project
Week 2	Lab.2: Setup a New project
Week 3	Lab.3: Creating Calendar to the project
Week 4	Lab.4: Adding task to project
Week 5	Lab.5: Set up resources
Week 6	Lab.6: Formatting and sharing a plan
Week 7	Lab.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. Y. Bakouros and V. Kelessidis "Project management" INNOREGIO: dissemination of innovation and knowledge management techniques, January 2000 Project Management: The Managerial Process, Larson and Gray, McGrawHill, 6th edition, 2014. Project Management for Profit: A Failsafe Guide to Keeping Projects On Track and On Budget Hardcover – June 26, 2012 by Joe Knight (Author), Roger Thomas)Author(، Brad Angus)Author(، John Case)Contributor(	yes
Recommended Texts	Lectures by lecturer	yes
Websites	http://www.projectmanagement.com/main.htm	

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

الفصل الدراسي: الثامن

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	**Cloud Computing**	**Module Delivery**
Module Type	**Core**	☒ **Theory**
Module Code	**CCP8**	☐ **Lecture** ☒ **Lab**
ECTS Credits	**5.00**	☐ **Tutorial**
SWL (hr/sem)	**125**	☐ **Practical** ☐ **Seminar**

Module Level	4	**Semester of Delivery**	8
Administering Department	MCCE	**College**	COE
Module Leader	Ansam Qasim Kamil	**e-mail**	qasim@uoitc.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	M.S.c.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CPR3 (Computer Programming 2)	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Install Windows Server. 2. Use and administer Windows Server in a domain environment. 3. Create users and groups and manage each in a domain and local environment 4. Set up and maintain shared file system resources 5. Implement and administer network printing 6. Secure Windows Server.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. To acquaint student with the functions of a server. 2. To provide student with Windows Server terms and concepts. 3. To provide student with an understanding of Windows Server installation, configuration and maintenance. 4. Providing students with general knowledge in windows server 5. Providing students with the ability to properly deal with windows server programs 6. Providing students with the ability to create users and groups and manage each in a domain and the local environment 7. Provide students with a skill in preparing and maintaining shared file system resources
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Theory Introduction to Network Administration Work group:[10 hours] Install Windows Server. Introduction to Windows Server 2008 Domain use and administer Windows Server in a domain environment. [10 hours] Create users and groups and manage each in a domain and local environment Installing Windows Server 2008. [8 hours] Set up and maintain shared file system resources Installing Windows Server 2008. [10 hours] Implement and administer network printing Configuring the Windows Server 2008 . [8 hours] Secure Windows Server Part B - Practical Windows Server 2008 Lab. [2 hours] Installing Windows Server 2008. [4 hours] Configuring Remote Access services. [2 hours] Securing Windows Server 2008. [4 hours] Configuring Windows Server 2008 Printing. [2 hours]

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	Acquisition of student's general knowledge with the preparation and maintenance of resources and, applying what the students gained from Windows server knowledge to implement the printing network and secure Windows server. specific function.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment		100% (100 Marks)			

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Network Administration Workgroup
Week 2	Introduction to Network Administration domain
Week 3	Introduction to Windows Server 2008
Week 4	Installing Windows Server 2008
Week 5	Installing Windows Server 2008
Week 6	Configuring the Windows Server 2008 Environment
Week 7	Mid-term Exam
Week 8	Managing Windows Server 2008 Services
Week 9	Introduction to Active Directory and Account Management
Week 10	Introduction to Active Directory and Account Management
Week 11	Configuring Remote Access services
Week 12	Configuring Remote Access services
Week 13	Securing Windows Server 2008
Week 14	Configuring Windows Server 2008 Printing
Week 15	Review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Windows Server 2008 Lab
Week 2	Lab 2: Windows Server 2008 Lab
Week 3	Lab 3: Windows Server 2008 Lab
Week 4	Lab 4: Windows Server 2008 Lab
Week 5	Lab 5: Windows Server 2008 Lab
Week 6	Lab 6: Windows Server 2008 Lab
Week 7	Lab 7: Windows Server 2008 Lab
Week 8	Mid-term Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	On Microsoft Windows Server 2008 by Michael Palmer, Publisher: Course Technology, 2009.	Yes
Websites	Reports, periodicals and general magazines.	

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	**Internet of Things**		**Module Delivery**	
Module Type	**Elective**		☒ Theory	
Module Code	IOT8		☐ Lecture	
ECTS Credits	**5.00**		☒ Lab	
SWL (hr/sem)	**125**		☐ Tutorial ☐ Practical ☐ Seminar	
Module Level	4	**Semester of Delivery**		8
Administering Department	MCCE	**College**	COE	
Module Leader	Ibrahim Abbas Ameen	**e-mail**	Ibrahim.ameen@uoitc.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**		M.Sc.
Module Tutor		**e-mail**		
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	16/06/2023	**Version Number**	1.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Computer Network I (CNT5)+ Embedded System (EDS7)	**Semester**	5+7
Co-requisites module	None	**Semester**	

1

	Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية
Module Objectives أهداف المادة الدراسية	1- Understand the fundamental concepts of IoT, including connectivity, communication protocols, data collection, and integration with existing systems. 2- Explore the technologies that enable IoT, such as wireless communication protocols, sensor technologies, cloud computing, edge computing, and data analytics. 3- Learn about the architecture of IoT systems, including the perception layer, network layer, middleware layer, and application layer. 4- Study security and privacy considerations in IoT, including vulnerabilities, authentication, encryption, and best practices for securing IoT systems. 5- Develop skills for designing and implementing IoT solutions, including hardware and software selection, application development, device integration, and system deployment. 6- Explore the diverse applications of IoT across various domains, such as healthcare, agriculture, smart homes, industrial automation, and transportation. 7- Consider the ethical and societal implications of IoT, including privacy, data ownership, consent, and the impact on employment and society.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1- Knowledge and Understanding: Gain a comprehensive understanding of IoT concepts, principles, and technologies. 2- Technical Skills: Develop skills in working with IoT technologies, including communication protocols, sensor integration, cloud computing, and data analytics. 3- System Design and Implementation: Acquire the ability to design and implement IoT solutions, including hardware selection, application development, and system deployment. 4- Security and Privacy Awareness: Understand the security challenges and privacy considerations in IoT and apply appropriate measures. 5- Problem-Solving and Analytical Thinking: Enhance problem-solving skills and analytical thinking through real-world IoT applications. 6- Ethical and Social Considerations: Understand the ethical and societal implications of IoT technology and make responsible decisions. 7- Communication and Collaboration: Develop effective communication and collaboration skills for IoT-related projects. 8- Critical Evaluation: Evaluate IoT solutions, technologies, and trends critically. 9- Lifelong Learning: Cultivate a mindset of continuous learning to keep up with IoT advancements.
Indicative Contents	Indicative content includes the following.

المحتويات الإرشادية	Part A – Introductory topics of IoT To study IoT concept(What is Internet of things, IoT requirements, IoT fields' motivations and challenges), Architecture layers(sensor and sensors networks layer, Networks layer, management services layer, Applications layer), Security and privacy (issues, Risks, and benefits), and Platforms (IoT platforms to visualize the data). [14 hrs] IoT communication protocols such as (Wifi, Bluetooth, Zigbee, 6LoWPan, LPWAN, and cellular). [10 hrs] Part B – IoT related Technologies Cloud Computing(clouds types, functions, and services) and Edge Computing (significance and technologies), Machine-to-Machine (M2M) Communications(Architecture, data traffic management) , and Big data topics(definition and management principles). [13 hrs] IoT ecosystems, IOT Data Storage & Retrieval, IOT Data Analytics & Visualization. [13 hrs] IOT Security, and IoT Applications and Case Studies (examples from real IOT projects). [10 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Lectures: Traditional lectures to introduce and explain key IoT concepts. 2- Interactive Discussions: Engage students in discussions about IoT applications and challenges. 3- Hands-on Projects: Assign practical projects to apply IoT knowledge and skills. 4- Case Studies: Analyze real-world IoT case studies to understand implementation challenges. 5- Group Work: Foster collaboration through group projects and teamwork. 6- Practical Labs: Provide hands-on experience with IoT devices and simulations. 7- Online Resources: Utilize online platforms and tutorials for additional learning. 8- Assessments and Feedback: Evaluate student understanding through various assessments and provide constructive feedback. 9- Continuous Learning: Emphasize the importance of staying updated on IoT advancements.

Student Workload (SWL)

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to the Internet of Things - IOT concepts - IOT requirements - IOT motivation - IOT Challenges
Week 2	IOT Architecture - Communication structure and theoretical analysis
Week 3	Security and Privacy in IoT

Week 4	IoT Devices and Platforms - Introduction to IoT hardware components (e.g., microcontrollers, single-board computers) - Overview of IoT platforms and frameworks for device management and data processing
Week 5	Communication Protocols for IoT - Wireless communication technologies for IoT (e.g., Bluetooth, Wi-Fi, Zigbee, cellular, Low Power Wide area networks) - IoT-specific protocols and standards (e.g., MQTT, CoAP, LoRaWAN)
Week 6	Communication Protocols for IoT - Wireless communication technologies for IoT (e.g., Bluetooth, Wi-Fi, Zigbee, cellular, Low power Wide area networks) - IoT-specific protocols and standards (e.g., MQTT, CoAP, LoRaWAN)
Week 7	Mid-term Exam
Week 8	Cloud Computing and Edge Computing for IoT - Cloud computing concepts and services for IoT applications - Edge computing and its role in IoT data processing and latency reduction
Week 9	Machine-to-Machine (M2M) Communications Machine to Machine (M2M) Applications
Week 10	Internet of Things Related Technologies- Big Data Analytics
Week 11	IoT ecosystems and IoT technology solutions
Week 12	IOT Data Storage & Retrieval (Overview and Role of Storage in Cloud / Server /Inhouse Storage, Databases Connectivity with IOT and uses, Case Study over Mysql / NoSql / NewSql, Case Study over Cloud Services And Administration, Case Study Of Big Data & Hadoop Platforms)
Week 13	IOT Data Analytics & Visualization
Week 14	IOT Security (Authentication in IoT, Computational Security for the IoT, Security Protocols for IoT Access Networks)
Week 15	IoT Applications and Case Studies - IoT applications (e.g., smart homes, wearables, industrial IoT)

	Case studies highlighting successful IoT deployments and their impact
Week 16	**Preparatory week before the final Exam**

	Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Analyze a case study project (project example from the internet) to understand the IoT Architecture Layers
Week 2	Lab 2: Introduction about Arduino IDE and development boards that include WIFI module
Week 3	Lab 3: Programming Node MCU and WeMoS D1 Mini boards
Week 4	Lab 4: Mini project- control a LED Via cloud computing using Mobile application
Week 5	Lab 5: Study IoT Platforms (Blynk and Thingspeak) as example
Week 6	Lab 6: Mini project- Monitor Air temperature and humidity via Thingspeak IoT platform
Week 7	Lab 7: Mini project- Controlling home appliance (Turn ON/OFF) using Blynk platform
Week 8	Lab 8: Mini project- collecting data form multiple nodes (Wireless sensor networks) using nRF24L01+ modules and display the data on an IoT Platform
Week 9	Lab 9: Mini project- Controlling multiple nodes (Wireless sensor networks) using nRF24L01+ modules and display the data on an IoT Platform
Week 10	Lab10: Students select their own IoT project to build
Week 11	Lab11: students projects discussions and solve problems
Week 12	Lab12: students projects discussions and solve problems
Week 13	Lab13: projects presentations and evaluations
Week 14	Lab14: projects presentations and evaluations
Week 15	Lab15: Lab sessions review.

	Learning and Teaching Resources مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	- Hwaiyu Geng, Internet of Things and Data Analytics Handbook, Wiley,2016 - Ovidiu Vermesan , Internet of Things –From Research and Innovation to Market Deployment, Italy, River Publishers ,2014	
Recommended Texts		

Websites	http://www.internet-of-things-book.com

<table>
<tr><td colspan="5" align="center">Grading Scheme
مخطط الدرجات</td></tr>
<tr><td>Group</td><td>Grade</td><td>التقدير</td><td>Marks %</td><td>Definition</td></tr>
<tr><td rowspan="5">Success Group
(50 - 100)</td><td>A - Excellent</td><td>امتياز</td><td>90 - 100</td><td>Outstanding Performance</td></tr>
<tr><td>B - Very Good</td><td>جيد جدا</td><td>80 - 89</td><td>Above average with some errors</td></tr>
<tr><td>C - Good</td><td>جيد</td><td>70 - 79</td><td>Sound work with notable errors</td></tr>
<tr><td>D - Satisfactory</td><td>متوسط</td><td>60 - 69</td><td>Fair but with major shortcomings</td></tr>
<tr><td>E - Sufficient</td><td>مقبول</td><td>50 - 59</td><td>Work meets minimum criteria</td></tr>
<tr><td rowspan="2">Fail Group
(0 – 49)</td><td>FX – Fail</td><td>راسب (قيد المعالجة)</td><td>(45-49)</td><td>More work required but credit awarded</td></tr>
<tr><td>F – Fail</td><td>راسب</td><td>(0-44)</td><td>Considerable amount of work required</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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

<table>
<tr><td colspan="3" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center">Mobile Applications Development</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Core</td><td rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center">MAD8</td></tr>
<tr><td>ECTS Credits</td><td align="center">5.00</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center">125</td></tr>
<tr><td>Module Level</td><td>4</td><td>Semester of Delivery   8</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College   COE</td></tr>
<tr><td>Module Leader</td><td>Saba A.Tuama</td><td>e-mail   Saba.ayad@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Lecturer</td><td>Module Leader's Qualification   Ph.D.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td></td><td>e-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number   1.0</td></tr>
</table>

<table>
<tr><td colspan="3" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Mobile Applications (MAP7)</td><td>Semester   7</td></tr>
<tr><td>Co-requisites module</td><td></td><td>Semester</td></tr>
</table>

	Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To familiarize the student with the fundamentals for understanding the principles of mobile application design and development 2. To provide the student with the knowledge of the evolution of modern mobile operating platforms and their operating systems and knowledge in the field of programming languages to create mobile applications. 3. To demonstrate the work at all stages of the software development life-cycle from inception through to implementation and testing.	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Install android platform in the computer 2. Recognize how to evolution of modern mobile operating platforms and their operating systems and knowledge in the field of programming languages to create mobile applications. 3. Recognize the capabilities and limitations of mobile devices 4. Design mobile applications with more than one user interface and more than one system component. 5. Develop mobile applications on a popular mobile development platform. 6. Develop an application using database and network connections. 7. Develop an application using GPS 8. Develop an individual applications based on given project subjects and Presentation of individual applications results	
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - **Android Platform**: - Flutter, Dart, Why use Flutter, What is a widget, the system requirements to install and run the flutter, Download Android studio [4h]. -Structure and lifecycle of an application for Android system [4h]. -**Graphical User Interface**: - Create the starter Flutter app, Types of widgets, Container widget, Text widget, Button widget, TextField widget, ListView widget [8h]. - Add the layout widget to the page , Material apps , Non-Material apps, mainAxisAlignment property [4h].	

	- Navigate and GridView, Create two routes, Navigate to the second route using Navigator.push(), Return to the first route using Navigator.pop(), GridView Example In Flutt, GridView [4h].
	-Processing of application resources
	- Building a layout, Diagram the layout, Implement the title row, Implement the button row, Implement the text section, Implement the image section, Put it together [4h].
	-Data persistence, Application security and permissions [4h].
	- Network communication, Internet applications and Wi-Fi connections [12h].
	- Geographical location, use of GPS data [4h].
	- Bluetooth communication [8h].
	- Deployment of applications [4h].

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Lectures: Interactive lectures will be conducted to introduce the fundamentals for understanding the principles of mobile application design and development.
	2. Laboratory Sessions: Hands-on laboratory experiments will provide practical experience in evolution of modern mobile operating platforms and their operating systems and knowledge in the field of programming languages to create mobile applications.
	3. Case Studies: Real-world case studies will be presented to illustrate the relevance of mobile application development on Android platform.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Android platform
Week 2	Structure and lifecycle of an application for Android system
Week 3	Graphical User Interface
Week 4	Graphical User Interface
Week 5	Processing of application resources
Week 6	Data persistence, Application security and permissions
Week 7	Data persistence, Application security and permissions
Week 8	Mid-term Exam (1)
Week 9	Network communication, Internet applications and Wi-Fi connections
Week 10	Network communication, Internet applications and Wi-Fi connections
Week 11	Network communication, Internet applications and Wi-Fi connections
Week 12	Geographical location, use of GPS data
Week 13	Bluetooth communication
Week 14	Deployment of applications
Week 15	Mid-term Exam (2)

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Install android platform in the computer.

Week 2	Lab 2: Introduction to the tools used in the lab/ Create a simple application.
Week 3	Lab 3: Developing of an application with Graphical User Interface.
Week 4	Lab 4: Developing of an application with Graphical User Interface.
Week 5	Lab 5: Developing of an application to Processing of application resources.
Week 6	Developing of an application using database.
Week 7	Developing of an application using database.
Week 8	Lab 8: Developing of an application using network connections.
Week 9	Lab 9: Developing of an application using network connections.
Week 10	Lab 10: Developing of an application using GPS.
Week 11	Lab 11: Developing of individual applications based on given project subjects.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Burnette E., Hello Android: Introducing Google's Mobile Development Platform, Pragmatic Bookshelf, 2010.	No
Recommended Texts	-Steele J., The Android Developer's Cookbook: Building Applications with the Android SDK, Addison-Wesley Professional, 2010. -Murphy M., Beginning Android 3., Apress, 2011.	No
Websites	https://www.udemy.com/topic/android-development/free/	

Grading Scheme
مخطط الدرجات

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

<table>
<tr><td colspan="3" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center"><b style="color:red">Mobile Communications II</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Core</td><td rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center"><b style="color:red">MCM8</td></tr>
<tr><td>ECTS Credits</td><td align="center">6.0</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center"><b style="color:red">150</td></tr>
<tr><td>Module Level</td><td>4</td><td>Semester of Delivery   8</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College   COE</td></tr>
<tr><td>Module Leader</td><td>Mohammed Khudhair Abbas</td><td>e-mail   mohammed.abbas@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Asst. Lec.</td><td>Module Leader's Qualification   MS.C.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail   E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number   1.0</td></tr>
</table>

<table>
<tr><td colspan="4" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Mobile Communications I (MCM7)</td><td>Semester</td><td>7</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Introducing the principles of wireless and mobile communication. 2. To understand the concepts of 2nd, 3rd generations cellular networks. 3. To understand the Technologies of LTE and ALE-A Cellular Networks. 4. To understand the small cells strategy, 5. Fifth generation of cellular networks 5G network operation and development of wireless networks.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basic concept for advance mobile communication system. 2. Study and understand mobile communication generations. 3. Understand and study the revolution after 3G. 4. Allow the students to analyze the mobile generations. 5. Analyze and build Mobile radio system for LTE. 6. Study and analyze 5G mobile system.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theory 1- Study the Cellular System model and all the related parameters [5 hrs] 2- Study and analyze the 1G & 2G generation technologies of mobile communication [5 hrs] 3- Study and analyze the 3G & 4G generation technologies of mobile communication [5 hrs] 4- Introduce the main requirements and performance for constructing LTE mobile network [7 hrs] 5- Introduce the Physical resource block and give strong and real examples [5 hrs] 6- Introduce the main components for constructing LTE-A mobile networkLTE-A [6 hrs] 7- Introduce the main components for constructing 5G mobile communication [7] Part B – Practical 1- Study and introduce 4G VoLTE Smartphone Interface and effective pins and ports [3 hrs]. 2- Analyze the Power Management Unit part and study its main functionalities [4 hrs] 3- Study and analyze the SIM Interface and apply real time communication [5 hrs] 4- Present the User Interface and all related functionalites [5 hrs] 5- Study all Modes of Operation for the 4G VoLTE Smartphone and find the scientific way to communicate properly [3 hrs]

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	Through theoretical and oral exams

1. Evaluate students' performance through classroom and extra-curricular activities
2. Evaluation by involving students in solving problems in front of others, during which the student's awareness of his moral and scientific responsibility is evaluated.
3. Transferred general and qualifying skills (other skills related to employability and personal development).
4. Providing students with general knowledge in computing mathematics
5. Applying the knowledge gained by students in computing mathematics in many areas of their specialization.
6. The ability to work effectively within a team to accomplish a specific task.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Evolution of Cellular system
Week 2	Basic Cell Architecture
Week 3	1G and 2G generation technologies
Week 4	3G generation technology, WCDMA and UMTS
Week 5	Long Term Evolution (LTE)
Week 6	requirements and system performance of LTE
Week 7	Mid-term Exam + Unit-Step Forcing, Forced Response, the RLC Circuit
Week 8	Technologies of LTE
Week 9	Physical resource block for (OFDM, OFDMA)
Week 10	LTE-A Cellular Networks
Week 11	MIMO, CoMP and Carrier Aggregation
Week 12	Small Cell Strategy
Week 13	LTE-A Technology
Week 14	Fifth Generation of Cellular Networks 5G
Week 15	Challenges for 5G and M2M Technology
Week 16	**Preparatory week before the final Exam**

	Delivery Plan (Weekly Lab. Syllabus)
	المنهاج الاسبوعي للمختبر
	Material Covered
Week 1	Lab 1: Study and analyze Power management unit in 4G LTE Smart Phone TechBook
Week 2	Lab 2: Study and analyze the phone and display On/Off and volume Up/Down section
Week 3	Lab 3: Study of switch faults in power on/off and volume control section
Week 4	Lab 4: Study SIM card detection with and without inserting SIM card
Week 5	Lab 5: Study and analyze the Buzzer & Vibrator in 4G LTE Smart Phone TechBook
Week 6	Lab 6: Study and analyze MIC & Speaker section in 4G LTE Smart Phone TechBook
Week 7	Lab 7: Real Clock Time

	Learning and Teaching Resources مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	Ziemer & Tranter, Principles of Communications - Systems, Modulation, and Noise, 7th edition,	Yes
Recommended Texts	Proakis & Salehi, Fundamentals of Communication Systems, 2nd edition, 2014	No
Websites	https://academy.theiet.org/mobile-communications-full-course	

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

<table>
<tr><td colspan="4">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td>Optical Fiber Communications</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td>Elective</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td>OFC8</td></tr>
<tr><td>ECTS Credits</td><td>5</td></tr>
<tr><td>SWL (hr/sem)</td><td>125</td></tr>
<tr><td>Module Level</td><td>4</td><td>Semester of Delivery</td><td>8</td></tr>
<tr><td>Administering Department</td><td>MCCE</td><td>College</td><td>COE</td></tr>
<tr><td>Module Leader</td><td>Yaqeen Sabah Mezaal</td><td>e-mail</td><td>Yaqeen.mezaal@uoitc.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Assistant Professor</td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>16/06/2023</td><td>Version Number</td><td>1.0</td></tr>
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<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Digital coomunicatio (DCM5)+electromagnetic Fields (EMF3)</td><td>Semester</td><td>3+5</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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	Module Aims, Learning Outcomes and Indicative Contents
	أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية
Module Objectives أهداف المادة الدراسية	1. To provide an understanding of the fundamental principles of optical fiber communication systems, including the properties of optical fibers and the components used in fiber optic systems. 2. To introduce the different types of optical fibers and their characteristics, such as single-mode and multimode fibers, and how they affect system performance. 3. To explain the principles of light propagation in optical fibers, including the concepts of attenuation, dispersion, and nonlinear effects. 4. To describe the different types of optical sources and detectors used in fiber optic systems, such as light-emitting diodes (LEDs) and photodiodes. 5. To discuss the different types of modulation techniques used in fiber optic systems, including amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM). 6. To introduce the different types of optical amplifiers used in fiber optic systems, such as erbium-doped fiber amplifiers (EDFAs). 7. To explain the principles of optical fiber networks, including point-to-point links, passive optical networks (PONs), and wavelength-division multiplexing (WDM). 8. To discuss the advantages and disadvantages of optical fiber communication systems compared to other communication technologies, such as copper wire and wireless communications. 9. To provide an overview of current research and development in optical fiber communication systems, including emerging technologies such as free-space optics and photonic integrated circuits. 10. To develop skills in designing, analyzing, and optimizing optical fiber communication systems through laboratory experiments and projects.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this module, learners will be able to: 1. Explain the fundamental principles of optical fiber communication systems, including the properties of optical fibers and the components used in fiber optic systems. 2. Compare and contrast the different types of optical fibers and their characteristics, such as single-mode and multimode fibers, and how they affect system performance. 3. Analyze the principles of light propagation in optical fibers, including the concepts of attenuation, dispersion, and nonlinear effects. 4. Evaluate the different types of optical sources and detectors used in fiber optic systems, such as light-emitting diodes (LEDs) and photodiodes. 5. Assess the different types of modulation techniques used in fiber optic systems, including amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM). 6. Evaluate the different types of optical amplifiers used in fiber optic systems, such as erbium-doped fiber amplifiers (EDFAs). 7. Analyze the principles of optical fiber networks, including point-to-point links, passive optical networks (PONs), and wavelength-division multiplexing (WDM).

	8. Compare and contrast the advantages and disadvantages of optical fiber communication systems compared to other communication technologies, such as copper wire and wireless communications. 9. Evaluate current research and development in optical fiber communication systems, including emerging technologies such as free-space optics and photonic integrated circuits. 10. Design, analyze, and optimize optical fiber communication systems through laboratory experiments and projects.
Indicative Contents المحتويات الإرشادية	Part 1: Introduction (4 hours) - The general system Part 2: Advantages of optical fiber communication (4 hours) Part3: Ray theory transmission (4 hours) - Total internal reflection - Numerical aperture - Electromagnetic mode theory for optical propagation Part4: Photonic crystal fibers (4 hours) Part5: Optical fibers types (4 hours) - Multimode fibers. - Single mode fibers Part6: Fabrication of fibers (4 hours) Part7: Transmission characteristics of optical fibers (4 hours) - Material absorption losses in silica glass fibers - Linear scattering losses - Nonlinear scattering losses Part8:Polarization(4 hours) Part9: Optical fiber Communication System: Transmitters (4 hours) - Optical sources 1: CW laser - Optical sources 2: the light-emitting diode (LED) Part10: Optical fiber connection: joints, couplers and isolators (4 hours) Part11: Optical fiber Communication System: Detectors (4 hours) - Optical detector 1: Photo detector (PD) -Optical detector 2: PIN photodiode Optical amplification, wavelength conversion and regeneration - Optical amplifiers and waveguide amplifiers Part12:Optical regeneration (4 hours) Part13: Integrated optics and photonics (4 hours) - Integrated optics and photonics technologies - Planar waveguides - Photonic integrated circuits - Optical computation Part14: Optical fiber systems 1: intensity modulation/direct detection (4 hours) - The optical transmitter circuit - The optical receiver circuit - Digital systems - Radio Over Fiber (ROF)

	Part15: Optical fiber systems (4 hours)
	-Optical fiber systems 1: intensity modulation/direct detection
	- Digital system planning considerations
	- Multiplexing strategies
	- Analog systems
	- Application of optical amplifiers
	-Optical fiber systems 2: coherent and phase modulated
	- Basic coherent system
	- Coherent detection principles
	- Practical constraints of coherent transmission
	-Optical fiber systems 2: coherent and phase modulated
	- Modulation formats
	- Demodulation schemes
	- Differential phase shift keying
	-Optical fiber measurements
	- Fiber attenuation & dispersion measurements
	- Fiber refractive index profile measurements

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Interactive lectures will be conducted to introduce theoretical concepts, principles of optical fiber communication. 2. Laboratory Sessions: Hands-on laboratory experiments will provide practical experience in optical fiber communication. 3. Problem-Solving Sessions: Regular problem-solving sessions will be held to reinforce understanding and develop problem-solving skills. 4. Group Discussions: Group discussions will encourage students to critically analyze and discuss optical fiber communication. 5. Case Studies: Real-world case studies will be presented to illustrate the relevance of optical fiber communication in various industries. 6. Assignments and Assessments: Assignments and assessments will be given to assess students' understanding about optical fiber communication.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction
Week 2	Ray theory transmission
Week 3	Optical fibers types
Week 4	Transmission characteristics of optical fibers
Week 5	Optical fiber Communication System: Transmitters
Week 6	Optical fiber Communication System: Detectors
Week 7	Midterm Exam (1)
Week 8	Optical amplification, wavelength conversion and regeneration
Week 9	Integrated optics and photonics
Week 10	Optical fiber systems 1: intensity modulation/direct detection (Part I)
Week 11	Optical fiber systems 1: intensity modulation/direct detection (Part II)

Week 12	Optical fiber systems 2: coherent and phase modulated (Part I)
Week 13	Optical fiber systems 2: coherent and phase modulated (Part II)
Week 14	Optical fiber measurements
Week 15	Midterm Exam. (2)

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to optical fiber communication
Week 2	Lab 2: Characterization of optical fibers: measurement of fiber diameter, numerical aperture, and attenuation coefficient
Week 3	Lab 3: Measurement of optical power and losses in a fiber optic link
Week 4	Lab 4: Comparison of single-mode and multimode fibers in terms of bandwidth, dispersion, and attenuation
Week 5	Lab 5: Analysis of dispersion effects in optical fibers using an optical time-domain reflectometer (OTDR)
Week 6	Lab 6: Measurement of the modulation transfer function (MTF) of an optical fiber system
Week 7	Lab 7: Evaluation of different types of optical sources and detectors, such as LEDs and photodiodes, in terms of power output and sensitivity
Week 8	Midterm Exam
Week 9, 10,12	Lab 8: Evaluation of different types of optical amplifiers, such as erbium-doped fiber amplifiers (EDFAs), in terms of gain and noise figure
Week 13, 14	Lab 9: Design and optimization of a point-to-point fiber optic link using WDM technology
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	John M. Senior "Optical Fiber Communications Principles and Practice" Prentice Hall, 3rd Edition 2009.	No

Recommended Texts	Joseph C. Palasis, "Fiber Optical Communications", Prentice Hall, 5th Edition 2005.		No	
Websites	https://en.wikipedia.org/wiki/Fiber-optic_communication			

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