University Name: University of Al-Qadisiyah
Faculty/Institute: College of Engineering.
Scientific Department: Electronics and Communications Department

Academic or Professional Program Name: BSc in Electronics and Communications Engineering

Final Certificate Name: Bachelor of Science in Electronics and Communications Engineering

Academic System: Semesters Description Preparation Date: / 11 / 2026

File Completion Date: / 11 / 2026

Signature:

Head of Department Name:

Asst. Prof. Dr. Hayder Miri Hamzah

Date: / 11 / 2026

Signature:

Scientific Associate Name:

Prof. Dr. Haitham Ali Al-Khalidi

Date: / 11 / 2026

The file is checked by: Prof. Dr. Musa Hadi Wali

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: / 11 / 2026

Signature:

Approval of the Dean

Prof. Dr. Ali AbdulHussain Al-Khalidi

Academic Program and Course Description Guide

Ministry of Higher Education and Scientific Research Scientific Supervision and Scientific Evaluation Apparatus Directorate of Quality Assurance and Academic Accreditation Department

College of Engineering-University of Al-Qadisiyah

2025-2026

1. Program Vision

Leadership in providing engineering education in accordance with international standards in the specializations of Electronics and Communications Engineering, to prepare qualified competencies that contribute to knowledge development, community building, and fostering innovation and excellence locally and internationally.

2. Program Mission

The Electronics and Communications Engineering program strives to provide high-quality education and applied research, and to qualify engineers with scientific competence and technical skills who possess a spirit of innovation and teamwork, contributing to the service of industry and society in accordance with the highest academic and professional standards.

3. Program Objective

1. Preparing scientifically and skillfully qualified engineers with high professional ethics, capable of competing locally and regionally in the fields of design, manufacturing, electronic devices, and communication systems.

2. Fostering, monitoring, and developing the scientific and educational direction of the department to achieve harmony and integration with global scientific and technical activities, aiming to expand and strengthen cooperation with scientific institutions worldwide.

3. Encouraging the dispatch of scientific missions and the granting of scholarships and study leaves in accordance with the current and anticipated needs of various specialized industrial and research facilities in the country.

4. Developing the teaching and learning environment to enhance creativity and raise the quality of academic and applied outcomes in the specialization of Electronics and Communications Engineering.

5. Promoting applied scientific research in electrical to keep pace with engineering challenges and serve society within an ethical framework.

6. Strengthening cooperation with industry and research institutions to provide training and

employment, and to solve societal problems using specialized knowledge.

7. Developing leadership and teamwork skills through applied projects that enhance students' practical competence.

8. Ensuring the quality of academic and administrative performance through continuous evaluation and compliance with academic accreditation requirements.

9. Contributing to sustainable development by graduating innovative engineers in the fields of energy and sustainability and enhancing community cooperation.

4. Learning Outcomes

The following Engineering Education Graduate Outcomes (GO) issued by the Iraqi Council for Engineering Education:

GO1. An ability to identify, define, formulate, and solve problems by applying principles of engineering, science, and mathematics.

GO2. An ability to produce engineering designs that meet desired needs within specified constraints by applying synthesis and analysis processes in the design process.

GO3. An ability to develop and conduct appropriate measurements and testing using valid, quality-assured methods, analyze and interpret results, and use sound engineering judgment to draw valid conclusions.

GO4. An ability to communicate effectively orally with individuals, groups, and the public, and in writing with various administrative levels and for diverse purposes.

GO5. An ability to recognize ethical and professional responsibilities in engineering issues and make informed judgments that consider their consequences in environmental, economic, social, and global contexts.

GO6. An ability to recognize the ongoing need for self-development of professional knowledge, and how to find, evaluate, synthesize, and apply it appropriately.

GO7. An ability to function effectively on teams, establish goals, plan activities, meet deadlines, adhere to cost ceilings, ensure quality, and manage risks and uncertainty.

5. Program Accreditation

None

6. Other External Influences

None

7. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews•
Institution Requirements	4	8	6.9%	--
College Requirements	7	16	12%	---
Department requirements	47	138	81.1%	----
Summer Training	yes	----	----	
Other		2	Graduation Project	

8. Program Description

Year / Level	Course Code	Course Name	Credit Hours
1st Level	ECE111	Mathematics I	4
1st Level	ECE112	Physics and materials	3
1st Level	ECE113	Computers Programming	4
1st Level	ECE114	Engineering Drawing and AutoCAD	2
1st Level	ECE115	Electrical Circuits I	3
1st Level	QU01	English language 1	2
1st Level	QU02	Democracy and Human Rights	2
2nd Level	ENG121	Mathematics II	4
2nd Level	ENG122	Static Mechanics	2
2nd Level	ENG123	Workshop Technology	
2nd Level	ECE124	Digital Technologies	3
2nd Level	ECE125	Electrical Circuits II	3
2nd Level	QU04	Computer1	1
2nd Level	QU06	Arabic language1	2
3rd Level	ENG211	Mathematics III	3
3rd Level	ECE212	Electronics I	3
3rd Level	ECE213	Digital Electronics	3
3rd Level	ECE214	Networks analysis 1	2
3rd Level	ECE215	Electromagnetic Fields 1	3
3rd Level	QU08	The Crimes of the Ba'ath Regime In Iraq	2
3rd Level	QU26	Arabic language2	2
4th Level	ENG221	Mathematics IV	3
4th Level	ECE 222	Networks analysis 2	2
4th Level	ECE223	Transmission lines	2
4th Level	ECE224	Electromagnetic Fields II	3
4th Level	ECE225	Electronics II	3
4th Level	QU24	Computer2	1
4th Level	QU21	English language2	2
5th Level	ECE311	Sustainability and Energy Conversion1	3
5th Level	ECE312	Communication systems I	3

5th Level	ECE313	Electronics III	3
5th Level	ECE314	Antennas	3
5th Level	ECE315	Computer Architecture	2
5th Level	ECE316	Optical Communications	3
5th Level	ECE317	Electronic Instrumentation	2
6th Level	ECE321	Sustainability and Energy Conversion2	2
6th Level	ECE322	Numerical Analysis	3
6th Level	ECE323	Statistics and probability	3
6th Level	ECE324	Communication systems II	3
6th Level	ECE325	Microprocessors	2
6th Level	ECE326	Waves Propagation	2
6th Level	QU	Ethics and Industrial Management	2
7th Level	ECE411	Control system 1	3
7th Level	ECE412	Information Theory and Coding	3
7th Level	ECE413	Microwave Engineering	3
7th Level	ECE414	Digital Signal Processing1	3
7th Level	ECE415	Digital system Design	3
7th Level	ENG416	Engineering Project	2
7th Level	ECE417	Networks And Communication Protocol	2
8th Level	ECE421	VLSI	3
8th Level	ECE422	Networks And Communication Protocol 2	3
8th Level	ECE423	Satellite Communications	3
8th Level	ECE424	Wireless and Mobile Communications	3
8th Level	ECE425	Control systems 2	3
8th Level	ENG416	Engineering Project (cont.)	2
8th Level	ECE427	Digital Signal Processing2	3

8. Intended Program Learning Outcomes	
Knowledge	
Learning Outcome 1	An ability to identify, define, formulate, and solve problems by applying principles of engineering, science, and mathematics.
Learning Outcome 6	An ability to recognize the ongoing need for self-development of professional knowledge, and how to find, evaluate, synthesize, and apply it appropriately.
Skills	
Learning Outcome 2	An ability to produce engineering designs that meet desired needs within specified constraints by applying synthesis and analysis processes in the design process.
Learning Outcome 3	An ability to develop and conduct appropriate measurements and testing using valid, quality-assured methods, analyze and interpret results, and use sound engineering judgment to draw valid conclusions.
Values	
Learning Outcome 4	An ability to communicate effectively orally with individuals, groups, and the public, and in writing with various administrative levels and for diverse purposes.
Learning Outcome 5	An ability to recognize ethical and professional responsibilities in engineering

	issues and make informed judgments that consider their consequences in environmental, economic, social, and global contexts.
Learning Outcome 7	An ability to function effectively on teams, establish goals, plan activities, meet deadlines, adhere to cost ceilings, ensure quality, and manage risks and uncertainty.

9. Teaching and Learning Strategies

1. Lectures to explain fundamental concepts to students, whether theoretical or applied, and engage them in discussion.

2. Homework and assignments to strengthen students' problem-solving abilities.

3. Quizzes and examinations to assess students and measure their comprehension of the scientific material.

4. In-class questions and discussions to boost students' self-confidence and gauge their capabilities.

5. Studying the relationship between theory and practice through laboratory activities and research projects.

6. Field trips and extracurricular activities to simulate real-world environments.

7. Seminars, discussions, reports, and presentations to develop teamwork skills and link academic knowledge with the labor market.

10. Teaching and Learning Strategies

The academic program relies on a variety of assessment methods to ensure a comprehensive measurement of students' attainment of cognitive, skill-based, and affective learning outcomes. The primary assessment methods are as follows:

1. Achievement Tests: Include monthly, midterm, and final examinations, as well as the theoretical analysis of concepts.

2. Practical / Laboratory Tests: To measure technical and practical skills.

3. Assignments and Reports: Aim to assess the ability to research, analyze, and apply critical thinking to specific topics.

4. Presentations: Assess communication skills, organization, content comprehension, and discussion.

5. Individual and Group Projects: Used to measure the integration of knowledge, practical skills, teamwork, and problem-solving.

6. Performance-Based Assessment: Involves executing field or laboratory tasks to assess the ability for real-world application.

7. Oral Examinations: To assess deep comprehension and oral expression skills.

8. Self-Assessment and Peer Assessment: Helps foster self-responsibility and critical thinking through reviewing individual or group performance.

9. Continuous Assessment: Includes quizzes, classroom observations, and participation.

11. Teaching Staff / Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements / Skills (if any)	Number of Faculty Members	
	General	Specific		Permanent	Lecturer
Professor	Electrical Engineering	Electronic Engineering		1	
Professor	Electrical Engineering	Communications Engineering		1	
Professor	Electrical Engineering	Power Electronics Engineering		1	
Assistant Professor	Electrical Engineering	Electronics and Communications		7	
Lecturer	Electrical Engineering	Electronics and Communications		6	
Assistant Lecturer	Electrical Engineering	Electronics and Communications		6	

12. Guidance for New Faculty Members

1. Teaching subjects based on specialization, ensuring alignment between the instructor's specialization and the assigned courses.

2. Commitment to schedules and teaching hours.

3. Developing and exerting scientific efforts in the specialization for publication.

4. Analyzing student pass and fail rates in the courses taught by the instructor.

5. Upgrading their qualification and training levels to serve the academic process.

6. Taking important courses such as those available at the Continuing Education Center.

13. Faculty Professional Development

An annual plan is established containing a set of programs and methods aimed at equipping faculty members with additional skills, knowledge, and modern techniques related to teaching, scientific research, administrative tasks, leadership, and community service. It includes several axes, including:

1. Developing teaching and learning strategies.

2. Assessing learning outcomes.

3. Professional development of faculty members.

4. Developing the e-learning process.

14. Admission Criteria

1. The applicant must hold an Iraqi secondary school certificate, or its equivalent, with a specialization in natural or technological sciences.

2. The applicant must be subject to the competitive system approved by the Ministry of Higher Education and Scientific Research / Central Admission Department, according to the student's average, preference subjects, and within the available number of study seats.

3. The number of available seats is determined according to what is decided by the College of Engineering Council at the University of Al-Qadisiyah based on the absorptive capacity and available human and material resources in the college. It is worth noting that the absorptive capacity of the Electronics and Communication Engineering Department is approximately 50 students annually.

4. Applicable laws allow top graduates of technical technological institutes (or distinguished employees) holding a technical diploma to be admitted within the department plan at a rate not exceeding 5% of the available seats.

5. The student accepted for study in the department must fulfill all active conditions and instructions, submit all required documents and credentials, and adhere to the timeframes specified for this purpose.

6. Admission averages in the Electronics and Communication Engineering Department represent some of the highest averages in the engineering group over many years due to the solid outcomes this program enjoys.

15. Main Sources of Information About the Program

1. College Academic Guide: Contains program descriptions, admission requirements, general structure, and study plan.

2. Official Website of the College and Department: Includes updated information about the program, faculty staff, course descriptions, and schedules.

3. Student Guidebook: Provided to students upon registration, including policies, regulations, academic procedures, and a guide to rights and duties.

4. Course Description Guide: Clarifies the objectives and outcomes of each course, teaching and assessment methods, and requirements.

5. Faculty Staff: A direct source of accurate information and answering student inquiries about the academic plan or educational pathway options.

6. Quality Assurance and Academic Accreditation Committee in the Department or College: Provides copies of official accreditation documents.

7. E-Learning Management System: Used by students to access study materials, academic announcements, and performance evaluations.

8. Official Announcements on Bulletin Boards or University Email: Include important updates such as registration dates, schedule changes, or curriculum modifications.

16. Program Development Plan

The continuous development and improvement plan relies on focusing on learning outcomes by taking into consideration the opinions of students, faculty members, and employers collectively, and cross-referencing them with the required learning objectives. The Quality Committee conducts periodic studies and analysis on the three mentioned elements and develops development plans in coordination with the Department Council and the Scientific Committee supervising the program. The following procedures are implemented:

1. Curriculum modifications after studying evaluations and coordinating with the Scientific Committee and Curriculum Committee according to labor market requirements.

2. Continuous development of faculty members by improving their electronic and interactive teaching methods.

3. Studying obstacles related to developing the quality of engineering education and proposing quick and appropriate solutions.

4. Providing several new laboratory equipment, measuring tools, and modern books.

5. Holding workshops and seminars with government institutions and the private sector and utilizing the capabilities of those institutions to link the labor market with the field of study and study the possibility of providing job opportunities for department graduates.

6. Increasing extracurricular activities for students, such as sports and scientific activities, to support students' research initiatives.

7. Measuring the level of academic program outcomes and developing assessment tools that provide correct indicators of their achievement.

8. Preparing all requirements and readiness to obtain academic accreditation.

7. Program Development Plan

Course Information				Knowledge				Skills				Values			
Year / Level	**Course Code**	**Course Name**	**Core or Elective**	**A1**	**A2**	**A3**	**A4**	**B1**	**B2**	**B3**	**B4**	**C1**	**C2**	**C3**	**C4**
2025-2026 / 1st	ECE111	Mathematics I	Core		X			X						X	
2025-2026 / 1st	ECE112	Physics and materials	Core	X				X						X	
2025-2026 / 1st	ECE113	Computers Programming	Core	X	X			X						X	
2025-2026 / 1st	ECE114	Engineering Drawing and AutoCAD	Core	X				X						X	
2025-2026 / 1st	ECE115	Electrical Circuits I	Core				X		X			X	X		
2025-2026 / 1st	QU01	English language 1	Core	X				X						X	
2025-2026 / 1st	QU02	Democracy and Human Rights	Core	X			X						X		
2025-2026 / 1st	ENG121	Mathematics II	Core	X				X						X	
2025-2026 / 1st	ENG122	Static Mechanics	Core	X	X			X						X	
2025-2026 / 1st	ENG123	Workshop Technology	Core	X				X						X	
2025-2026 / 1st	ECE124	Digital Technologies	Core		X					X				X	
2025-2026 / 1st	ECE125	Electrical Circuits II	Core		X					X					X
2025-2026 / 1st	QU04	Computer1	Core	X				X						X	
2025-2026 / 1st	QU06	Arabic language1	Core	X			X						X		X

2025-2026 / 2nd	ENG211	Mathematics III	Core	X			X						X		X
2025-2026 / 2nd	ECE212	Electronics I	Core	X	X			X						X	
2025-2026 / 2nd	ECE213	Digital Electronics	Core				X	X				X	X		
2025-2026 / 2nd	ECE214	Networks analysis 1	Core	X			X						X		
2025-2026 / 2nd	ECE215	Electromagnetic Fields 1	Core	X	X			X	X						
2025-2026 / 2nd	QU08	The Crimes of the Ba'ath Regime In Iraq	Core		X	X	X							X	
2025-2026 / 2nd	QU26	Arabic language2	Core	X	X			X	X			X			X
2025-2026 / 2nd	ENG221	Mathematics IV	Core		X					X				X	
2025-2026 / 2nd	ECE 222	Networks analysis 2	Core	X				X						X	
2025-2026 / 2nd	ECE223	Transmission lines	Core	X				X						X	
2025-2026 / 2nd	ECE224	Electromagn etic Fields II	Core		X	X		X	X					X	
2025-2026 / 2nd	ECE225	Electronics II	Core		X	X		X	X		X			X	
2025-2026 / 2nd	QU24	Computer2	Core		X	X		X	X			X		X	
2025-2026 / 2nd	QU21	English language2	Core	X				X						X	
2025-2026 / 3rd	ECE311	Sustainability and Energy Conversion1	Core		X	X		X	X					X	

2025-2026 / 3rd	ECE312	Communication systems I					X			X		X			
2025-2026 / 3rd	ECE313	Electronics III	Core	X				X						X	
2025-2026 / 3rd	ECE314	Antennas	Core	X				X						X	
2025-2026 / 3rd	ECE315	Computer Architecture	Core		X	X		X	X					X	
2025-2026 / 3rd	ECE316	Optical Communications	Core		X	X		X	X					X	
2025-2026 / 3rd	ECE317	Electronic Instrumentation	Core		X	X		X	X					X	
2025-2026 / 3rd	ECE321	Sustainability and Energy Conversion2	Core	X				X			X		X		
2025-2026 / 3rd	ECE322	Numerical Analysis	Core		X	X		X	X					X	
2025-2026 / 3rd	ECE323	Statistics and probability	Core			X		X	X	X		X			X
2025-2026 / 3rd	ECE324	Communication systems II	Core			X		X	X	X		X			X
2025-2026 / 3rd	ECE325	Microprocessors	Core			X		X	X	X		X			X
2025-2026 / 3rd	ECE326	Waves Propagation	Core			X		X	X	X		X			X
2025-2026 / 3rd	QU	Ethics and Industrial Management	Core			X		X	X	X		X			X
2025-2026 / 4th			Core			X		X	X	X		X			X
2025-2026 / 4th	ECE411	Control system 1	Core		X					X				X	
2025-2026 / 4th	ECE412	Information Theory and Coding	Core				X		X	X	X		X		

2025-2026 / 4th	ECE413	Microwave Engineering	Core			X		X	X	X		X			X
2025-2026 / 4th	ECE414	Digital Signal Processing1	Core				X		X	X	X		X		
2025-2026 / 4th	ECE415	Digital system Design	Core				X		X	X	X		X		
2025-2026 / 4th	ENG416	Engineering Project	Core				X		X	X	X		X		
2025-2026 / 4th	ECE417	Networks And Communications Protocol	Core			X		X	X	X		X			X
2025-2026 / 4th	ECE421	VLSI	Core		X	X			X	X				X	
2025-2026 / 4th	ECE422	Networks And Communication Protocol 2	Core		X	X	X		X		X				
2025-2026 / 4th	ECE423	Satellite Communications	Core	X			X		X	X	X		X		
2025-2026 / 4th	ECE424	Wireless and Mobile Communications	Core	X			X		X	X	X		X		
2025-2026 / 4th	ECE425	Control systems 2	Core	X			X		X	X	X		X	X	
2025-2026 / 4th	ENG416	Engineering Project (cont.)	Core	X			X		X	X	X		X	X	
2025-2026 / 4th	ECE427	Digital Signal Processing2	Core	X			X		X	X	X		X		

COURSE DESCRIPTION FORMS

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics I**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE111**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		1	**Semester of Delivery**		1
Administering Department		ECE	**College**	Type College Code	
Module Leader	Kawthar Al-fatlawi		**e-mail**	Kawther.alfatlawi @qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name		Kawthar Al-fatlawi	**e-mail**	Kawther.alfatlawi @qu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim of the module is to review and enhance aspects of university mathematics in order to foster genuine confidence and fluency with the material. This will help provide a firm grasp of basic ideas thus allowing concentration on the many new and often abstract concepts that will be introduced in various modules throughout the academic program.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize Graphs the Functions and Circles and conic Section. 2. Understand the Limit Laws and Differentiation laws. 3. Recognize the Velocity, speed, and other rates of change. 4. Understand the Implicit Differentiation and Related rate of change, maxima and minima. 5. Graphing with rational functions and Curve sketching with first and second derivatives 6. Recognize Graphing with rational functions and Curve sketching with first and second derivatives. 7. How to solve the Derivatives Trigonometric Functions and Inverse functions and their derivatives. 8. Recognize the Complex Number. 9. Recognize the Indefinite Integrals and Substitution Rules. 10. Utilizing Definite Integrals and using their applications. 11. Solve integration problems by Integration by Parts, Trigonometric Substitution, Partial Fractions and Tabular integration. 12. How to solve the Derivatives and Integral of Inverse Trigonometric and Hyperbolic Functions.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Derivatives Functions and their Graphs Limit Laws and Differentiation laws Velocity, speed and other rates of change Implicit Differentiation and Related rate of change, maxima and minima Graphing with rational functions and Curve sketching with first and second derivatives Derivatives Trigonometric Functions and Inverse functions and their derivatives Complex Number Part B Integration Indefinite Integrals (Substitution Rules, Integration by Parts, Trigonometric Substitution, Partial Fractions, Tabular integration and Further Substitution)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	small groups of students they work to solve integration and differentiation problems to motivate students to think about choosing the best ways to solve problems and to make learning more interesting to attract students' attention.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	80	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	27% (27)	5, 9,13	LO # 1 - 9
	Assignments	1	10%(10)	Continue	All
	Projects	-	0% (0)		
	Report	1	3% (3)	12	All
Summative assessment	**Midterm Exam**	1	10% (10)	8	LO # 1-5
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Graphs the Functions and Circles and conic Section.
Week 2	Limit Laws and Differentiation laws.
Week 3	Velocity, speed and other rates of change.
Week 4	Implicit Differentiation and Related rate of change, maxima and minima.
Week 5	Graphing with rational functions and Curve sketching with first and second derivatives.
Week 6	Derivatives Trigonometric Functions and Inverse functions and their derivatives.
Week 7	Mid Exam
Week 8	Complex Number.
Week 9	Indefinite Integrals and Substitution Rules.
Week 10	Definite Integrals and Applications of definite Integrals.
Week 11	Integration by Parts.
Week 12	Trigonometric Substitution.
Week 13	Partial Fractions.
Week 14	Tabular integration and Further Substitution.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	THOMAS' CALCULUS TWELFTH EDITION	Yes
Recommended Texts		
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	**Physics and materials**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE112**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Type College Code	
Module Leader	Raheem Abd Jabur		**e-mail**	raheem_almuramudhi@qu.edu.iq	
Module Leader's Acad. Title	Asst. Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	electronic	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To understand the Energy band structure of metal, insulators, and semiconductors. 2. To develop problem-solving skills and understanding of P-N Junction (Diode) 3. To analyze the diode circuit and applications such as half-wave, full-wave, clamping, and clipping. 4. To understand the principles of the transistor
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental principles of solid-state physics and semiconductor materials. 2. Describe charge carrier transport and electrical conduction in semiconductors. 3. Analyze the operation and characteristics of semiconductor devices. 4. Explain the operating principles of diodes and transistors. 5. Apply semiconductor physics concepts to electronic device applications
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Part A: The principal energy band in a solid, the Bohr model, and the Fermi-Dirac distribution function Part B: Transport Phenomena in Semiconductor and p-n junction. Part C: Diode application Part D: The principles of the transistor

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Lectures - Question and answers - Teacher-student interaction - Reports - Presentation

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	35	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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**	3	10% (10)	3,6, 11	all
	Assignments	2	10% (10)	2, 12	LO # 3, 4, and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, and 5
Summative assessment	**Midterm Exam**	2 hr.	10% (10)	7	LO # 1-2
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to energy band in solid, the Bohr model.
Week 2	Introduction to the de Broglie hypothesis and the Fermi-Dirac distribution function
Week 3	Transport Phenomena in Semiconductor, silicon, germanium, Current in metals and semiconductors
Week 4	Diffusion Current, Electrons and Holes Density in an Intrinsic Semiconductor
Week 5	Electrons and Holes Density in an Extrinsic Semiconductor
Week 6	Electrical conduction in semiconductor
Week 7	Hall Effect, Photoconductivity

Week 8	Mid-term Exam
Week 9	The structure of p-n junction, Forward bias, Reverse bias
Week 10	The center-tapped and The Bridge full-wave rectifier, Ripple factor
Week 11	Diode Clipping and Clamping Circuit
Week 12	The Zener Diode
Week 13	The principles of the transistor
Week 14	The application of transistor
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Achieve Ohm's Law
Week 2	Lab 2: Electron diffraction experiment
Week 3	Lab 3:. Zeeman effect
Week 4	Lab 4: Hall experiment
Week 5	Lab 5: Diode Characteristics

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- "Integrated Electronics" Mcgraw Whill, Threprint 1995. By Millman & Halkies	Yes
Recommended Texts	2- "Semiconductor Devices & Circuits" John Wiley & Sons 2991٬. By: M.S. Tyagi	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	**Computer Programming**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE113**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Type College Code	
Module Leader	Wurood Idrees Shatnan		**e-mail**	Worod.adris@qu.edu.iq	
Module Leader's Acad. Title	Assistant Lecture		**Module Leader's Qualification**	Master	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understand the standard C++ and how to write programs. 2. Understanding how to use the condition statement. 3. Studying the relational and logical operations. 4. Understanding the loops in C++. 5. Understand the standard function in C++ and user define functions. 6. Understanding how to create the one and two dimensions of array. 7. Studying the various list processing (search, sort , insert…). 8. Understanding the struct variable and function.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will demonstrate the ability to write coding by using C++ commands. 2. Students will understand the basic of C++. 3. Students will demonstrate the condition statements and the tools using for it. 4. Students will demonstrate the loops. 5. Students will demonstrate the ability to write coding by using C++ commands. 6. Students will understand the Arrays and how to create it. 7. Students will demonstrate the string (character array). 8. Students will demonstrate the structure functions.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Introduction to C++ programming, modifying first program . 2. Variables, constant and data types. 3. Arithmetic, logical, and comparison operations. 4. Control statements. 5. iteration loops. 6. Arrays, one dimension and two dimensions. 7. User defined functions, void and return functions. 8. Structure variable and functions.

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	95	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**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, 10	LO #1, 2, 10
	Assignments	2	10% (10)	2, 12	LO # 3, 4
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Structure of C++ program and basic files, Install program.
Week 2	Types of libraires, variables and datatypes.
Week 3	Arithmetic, logical and relational operations
Week 4	I/O program, comments, brackets
Week 5	Control statements, if condition
Week 6	Nested if , following the program, and Iteration loops (for , while).
Week 7	Mid-term Exam
Week 8	(do …while)loop with applications , Nested loops
Week 9	The sentence (scanf , printf), stdio library

Week 10	The sentence (break , continue , casting), public and private variables
Week 11	Function: standard Functions, user-defined functions, void functions and parameters
Week 12	void functions: Reference parameters and memory allocation, Array and string: one dimensional array, array as parameters to function
Week 13	List processing (Serach , Sort , insert and delete an item from the list) ,
Week 14	Two dimensional array and function , Records (structs) , Struct Variables and function C-string(character Arrays), Comparison Reading and Writing strings
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to C++ language programming , install program , program interface
Week 2	Lab 2: define Variables and data type
Week 3,4	Lab 3: condition statement
Week 5,6	Lab 4: loops
Week 7	Practical Exam
Week 8,9	Lab 5: matrices
Week10,11,12	Lab 6: functions, list processing ,
Week 13,14,15	Lab 7: string , Structures

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**البرمجة بلغة C++ مع الأمثلة والتمارين**	Yes
Recommended Texts	C++ How to Program / Paul Deitel	
Websites	https://practice.geeksforgeeks.org/courses/cpp-programming-basic-to-advanced	

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	**Engineering Drawing and AutoCAD**			**Module Delivery**	
Module Type	Basic			**Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE114				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	ENG-QU	
Module Leader	Hassan Hamid		**e-mail**		
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSc.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Musa Hadi Wali		**e-mail**	Email: musa.h.wali@qu.edu.iq	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
أهداف المادة **Course Objectives:**	Fundamentals and rules of engineering drawing with content that benefits all engineering disciplines and other educational institutions. It also includes recognition of drawing straight and curved lines, representation of

	engineering projections, and ending with representation of perspectives, as well as representation of intersections and engineering sectors. 1. Introducing students of the College of Engineering to the basic principles of engineering drawing. 2. Focusing on the use of engineering drawing tools and gaining practical experience in drawing by hand in preparation for learning drawing using a computer. 3. Help the student how to draw engineering processes. ٤.Helping the student on how to draw engineering and find the projections of segments, and vice versa, how to draw the perspective of objects based on the projections. .
Course Contents:	1 .An introduction to engineering drawing, the tools used and how to use them 2 .Composition of engineering drawings. 3 .Writing letters and numbers 4 .Write the dimensions 5 .Engineering operations. 6 .Drawing engineering projections. 7 .Discover the third projection 8. Drawing isometric
Course Outcomes:	**a) Knowledge-objective:** 1. Full knowledge of spatial engineering. 2. Knowledge of dropping objects from different directions. 3. The ability to imagine in a space. 4. The ability to determine the projections of objects. 5. Accuracy in the use of engineering drawing tools in designing engineering plans. 6. The ability to self-develop and use different research methods to develop computer graphics. 7. Using mathematical and software tools to analyze projections of objects. **b) Skills-objective:**

	1 .Use of relevant informatics methods and tools in engineering drawing. 2 .Use drawing tools correctly and effectively. 3 .Completion of simple engineering designs in the studio. 4. The ability to design and implement engineering projections using AutoCAD. **c) General and qualifying skills** (Other skills related to employ ability and personal development) 1 .Demonstrate effective interpersonal skills represented in devising solutions and proposing creative ideas. 2 .The ability to continuously learn and develop skills and knowledge through self- learning. 3. Manage projects, tasks, resources and time seriously and effectively. 4 .The ability to systematically analyze a problem and implement effective solutions both individually and within a group. 5. The ability to make decisions.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Teaching and learning methods	The learner's scientific and research skills are developed through teaching and learning activities, analysis skills, a way of imagining, remembering, and focusing on the smallest details to obtain an accurate form. Education begins with how to plan and divide the drawing paper, determine the basics of drawing and types of lines, how to draw engineering processes, draw engineering projections, and imagine the perspective, and then by means of a set of drawings prepared by the teacher through lectures and assignments that are given to students to know their skills, and evaluation and response to all work submitted. Teaching is done in the usual theoretical way using the blackboard and relying on the method (how and why) to motivate the student to learn and know.
Academic responsibility	Assignments and tests are expected to be the sole effort of the student to submit. Students are expected to follow the regulations of the Ministry of Higher Education / University of Al-Qadisiyah regarding academic behavior that regulates the relationship between the student and the professor, and

	every suspected case of violation will be reported. All students are obligated to follow the University of Al-Qadisiyah Academic Responsibility Code and any case of cheating in any form will be prosecuted to the fullest extent possible. Discussion of homework between students is permitted and encouraged, but blind copying is not acceptable. The general rule is that the work you hand in must be yours.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	70	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) 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, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Class activity	All	10% (10)		All
	Attendance	All	10% (10)		All

Summative assessment	**Midterm Exam**	2 hr	10% (10)	6	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction. Drawing tools.**
Week 2	**Basic of the engineering drawings. Planning (framed), table , writing data . Type of line**
Week 3	**Engineering operations.**
Week 4	**Engineering operations.**
Week 5	**Engineering operations.**
Week 6	**Test 1** (In class, 60-minute)
Week 7	**Orthographic projections**
Week 8	**Orthographic projections**
Week 9	**Sectional view**
Week 10	**The conclusion projections**
Week 11	**isometric**
Week 12	**Auto-CAD**
Week 13	**Auto-CAD**
Week 14	**Auto-CAD**
Week 15	**Auto-CAD**
Week 16	**Final exam (120-minute)**

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	#. الطبعة الثانية . ١٩٩٣ .الرسم الهندسي . عبد الرسول الخفاف #كتاب الرسم الاوتوكاد	Yes
Optional book	Graphics for Engineers, James H. Earle, 14thed., Prentice-Hall, UK .1 Technical Drawing 13th Edition, F. E. Gisesecke, A. Mitchell, H. C. .2 Spencer, I. T. Hill, J. T. Dygdon, J. E. Novak, S. Lockhart, 2009.	

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	**Electrical Circuits I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE 115**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level		**1**	**Semester of Delivery**		**1**
Administering Department		**Type Dept. Code**	**College**	**Collage of Engineering**	
Module Leader	**Fahad Ahmed Al-Amyal**		**e-mail**		
Module Leader's Acad. Title		**Lecturer**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor	**Name (if available)**		**e-mail**	**fahad.alamyal@qu.edu.iq**	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		**01/06/2025**	**Version Number**		**1.0**

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**This course aims to:** **1. Introduce fundamental circuit concepts, quantities, units, and circuit elements.** **2. Develop essential skills in analyzing resistive networks using basic circuit laws, reduction techniques, and voltage/current division principles.** **3. Provide structured methodologies for systematic network analysis including Kirchhoff's Laws, Branch Currents, and Node Voltage methods.** **4. Apply key network simplification techniques such as Delta-Star transformations and source conversions.** **5. Master network theorems including Superposition, Thevenin, Norton, and Maximum Power Transfer for linear DC circuit analysis.** **6. Provide practical laboratory training on DC measuring equipment, breadboard circuit assembly, and experimental verification of circuit laws.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**By the end of this module, students should be able to:** • **LO1: Explain fundamental concepts, electrical quantities, and parameters of linear circuit components.** • **LO2: Calculate equivalent resistance and analyze series, parallel, and series-parallel circuit configurations.** • **LO3: Apply Ohm's Law and voltage/current division rules to evaluate branch variables.** • **LO4: Perform source conversions and apply Delta-Star (Y-Delta) transformations to simplify complex networks.** • **LO5: Analyze electric circuits systematically using Kirchhoff's Laws, Branch Current Analysis, and Node Voltage Analysis.** • **LO6: Apply Superposition, Thevenin's, Norton's, and Maximum Power Transfer theorems to evaluate and simplify multi-source linear networks.** • **LO7: Construct physical DC circuits, operate measuring instruments (multimeters, DC power supplies), and experimentally verify circuit laws and theorems safely in the laboratory.**
Indicative Contents المحتويات الإرشادية	**This module provides a foundational study of direct current (DC) linear electrical circuits.** **It starts with introductory circuit theory, fundamental quantities (charge, current, voltage, energy, power), basic elements, electrical resistance, and temperature dependence. It covers series and parallel resistive combinations, equivalent resistance derivations, Ohm's Law, and voltage and current divider rules.** **The course presents source conversion theory and transformations between ideal/practical voltage and current sources. Systematic analysis techniques are introduced: Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Branch Currents Analysis Method, and Node Voltage Analysis Method.** **Network reduction methods include Delta-Star (Wye-Delta) and Star-Delta conversions. Advanced network theorems for multi-source circuit analysis are**

	thoroughly examined: Superposition Theorem, Thevenin's Theorem (equivalent voltage source and impedance), Norton's Theorem (equivalent current source and impedance), and the Maximum Power Transfer Theorem for optimal power delivery to resistive loads.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**The teaching approach for this module combines theoretical foundations with practical laboratory execution and structured problem-solving methodologies:** **• Interactive Lectures: Delivering core circuit principles, fundamental laws, and systematic analytical techniques through whiteboard explanations and multimedia presentations.** **• Practical Laboratory Work: Hands-on experimental sessions where students construct physical electrical circuits, measure electrical quantities (voltage, current, resistance) using bench instruments, and experimentally verify basic circuit laws and network theorems.** **• Tutorial Sessions: Dedicated problem-solving hours focusing on circuit analysis, calculations, and network theorem applications under the instructor's guidance.** **• Self-Directed Study & Homework: Regular assignments designed to encourage independent critical thinking, analytical depth, and consistent practice.** **• Continuous Assessment & Quizzes: Frequent short evaluations, laboratory report reviews, and classroom discussions to monitor student progress and comprehension.**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**95**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**7**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**85**	**Unstructured SWL (h/w)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	**4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
	Quizzes	4	15% (15)	2, 5, 9, 12	LO1, LO2, LO3, LO5

Formative assessment	**Assignments & HomeWorks**	4	10% (10)	2, 5, 9, 12	2, 5, 9, 12
	Laboratory Reports & Performance	All weeks	10% (10)	Continuous	LO7
	Class Attendance & Participation	1	5% (5)	Continuous	All LO1–LO6
Summative assessment	**Midterm Exam**	2 hr.	10% (10)	7	LO1–LO6
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction & Circuit Theory: Overview of electrical engineering circuits, physical units, electrical quantities (current, voltage, energy, and power), and passive vs. active circuit elements.**
Week 2	**Basic Concepts of Electrical Circuits: Ideal and practical energy sources, voltage/current sources, circuit nodes, branches, loops, and mesh definitions.**
Week 3	**Electrical Resistance: Concept of resistance, Ohm's law fundamentals, and power dissipation in resistive elements.**
Week 4	**Series and Parallel Resistances: Analysis of series-connected resistors, parallel-connected resistors, equivalent resistance calculations, and combined series-parallel resistive networks.**
Week 5	**V & C Dividing Rules: Voltage Divider Rule (VDR) for series circuits, and Current Divider Rule (CDR) for parallel branches.**
Week 6	**Source Conversion Theory: Equivalence between voltage and current sources, conversion technique for practical voltage sources with series resistance to equivalent practical current sources with parallel resistance.**
Week 7	**Mid-Term Exam: Theoretical assessment covering fundamental circuit concepts, resistor reduction techniques, divider rules, and source transformations.**
Week 8	**Analysis by Kirchhoff's Laws: Detailed formulation and application of Kirchhoff's Current Law (KCL) at circuit nodes and Kirchhoff's Voltage Law (KVL) around closed loops.**
Week 9	**Branch Currents Analysis Method: Systematic circuit solving technique using branch currents, setting up simultaneous linear algebraic equations based on KCL and KVL.**

Week 10	**Node Voltage Analysis Method: Matrix formulation and nodal analysis technique, selecting reference nodes, writing nodal equations for linear networks with independent and dependent sources.**
Week 11	**Delta – Star Conversion: Three-terminal network transformations, Delta-to-Star (Y) and Star-to-Delta formulas, simplification of bridge networks and non-series-parallel configurations.**
Week 12	**Superposition Theorem: Principles of linearity and superposition in multi-source circuits, step-by-step activation and deactivation of independent voltage/current sources to solve for electrical responses.**
Week 13	**Thevenin's Theorem: Network reduction theorem, determining open-circuit Thevenin voltage (Vth), calculating equivalent Thevenin resistance (Rth), and constructing single-source equivalent circuits.**
Week 14	**Norton Theorem: Dual network theorem, calculating short-circuit Norton current (IN), determining equivalent Norton resistance (RN), and establishing equivalent current-source models.**
Week 15	**Maximum Power Transfer & Practical Review: Derivation and application of Maximum Power Transfer theorem for load matching (RL = Rth), load efficiency evaluation, and preparatory review before final examinations.**
Week 16	**Final Examination**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Introduction to LAB Equipment**
Week 2	**Use of AVO meter**
Week 3	**Applying series and parallel rules**
Week 4	**Applying Ohm's Law**
Week 5	**Applying V & C dividing rules**
Week 6	**Test for previous experiments**
Week 7	**Mid-term Exam**
Week 8	**Applying Kirchhoff's Laws**
Week 9	**Verifying Branch Current Method**
Week 10	**Implementing Node Voltage Method**
Week 11	**Applying Delta – Star Conversion**
Week 12	**Verifying Superposition Theorem**

Week 13	**Implementing Th'evenin Theorem**
Week 14	**Implementing Norton Theorem**
Week 15	**Verifying Maximum Power Transfer**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Introductory Circuit Analysis by Boylestad**	**Yes**
Recommended Texts	**1. Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education** **2. DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.**	**No**
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**English Language 1**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**QU01**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		1	**Semester of Delivery**		١
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**		
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**	hayder.hamzah@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		10/10/2026	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The primary aim of *New Headway Beginner* is to provide a foundation course in basic English for zero-English beginners or those who lack confidence to build on existing knowledge. The course aims to develop survival-level communication skills for low-level students in English-speaking environments
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize and use the English alphabet, numbers 0-100, and basic everyday objects vocabulary. 2. Introduce themselves and others, and ask/answer basic personal information questions (name, age, address, nationality). 3. Use the Present Simple to talk about daily routines, habits, likes, and dislikes. 4. Form questions using common question words (what, who, where, when, how much). 5. Use there is/there are, some/any, and prepositions of place to describe their home and town. 6. Talk about past events using was/were and the Past Simple (regular and irregular verbs). 7. Use can to express ability and ask for permission. 8. Handle basic functional situations: asking prices, telling the time, asking for directions, and making simple requests.
Indicative Contents المحتويات الإرشادية	1. Countries/nationalities, to be (he/she/it/they), question words 2. Jobs, a/an, possessive 's, personal information questions 3. Family members, adjectives, have/has 4. Present Simple (I/you/we/they), sports/food/drinks, likes/dislikes, numbers 31-100, prices 5. Present Simple (he/she/it), daily routines, time, days of the week, prepositions of time 6. Object pronouns, can (ability/permission), adverbs, requests 7. There is/are, some/any, rooms/furniture, places in town, directions 8. Was/were, was/were born, Past Simple (irregular verbs), saying years 9. Past Simple (regular/irregular), Past Simple questions/negatives, ago 10. Can/can't (ability), adverbs (well, fluently), requests and offers 11. Countable/uncountable nouns, like vs would like, food/drink vocabulary 12. Present Continuous, Present Simple vs Present Continuous 13. Future plans (going to), revision of tenses and question words 14. Stop and Check tests, Progress tests, revision

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Step-by-step presentation: New language is presented gradually and methodically, giving learners a clear sense of progression. 2. Grammar focus: A strong grammatical syllabus with clear presentation and controlled practice before freer production.

	3. Integrated skills work: Listening, speaking, reading, and writing are developed together, with reading texts carefully graded and controlled at beginner level. 4. Communicative activities: Roleplays, pair work, and personalized speaking tasks (e.g., exchanging email addresses, party roleplays, lifestyle questionnaires). 5. Everyday English emphasis: Practical, "phrasebook" survival language rather than deep grammatical analysis. 6. Regular recycling: Vocabulary and grammar are revisited throughout the course.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٣
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10	Weeks 4, 10	MLO2, MLO3, MLO5, MLO7
	Assignments	4	20	Weeks ٦, ١٣	MLO1, MLO4, MLO6, MLO8
	Projects / Lab.	N/A	N/A	N/A	N/A
	Report	1	10	Week ١٤	MLO2, MLO3, MLO6
Summative assessment	**Midterm Exam**	1	10	Week 8	MLO1 – MLO7
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Countries/nationalities, *to be* (all persons), question words
Week 2	Jobs, *a/an*, possessive 's, personal information
Week 3	Family vocabulary, adjectives
Week 4	*have/has*; Stop and Check 1
Week 5	Present Simple (I/you/we/they), likes/dislikes, numbers/prices
Week 6	Present Simple (he/she/it), daily routines, time, prepositions
Week 7	Object pronouns, *can*, adverbs, requests; Stop and Check 2
Week 8	*There is/are*, *some/any*, home/town vocabulary, directions
Week 9	*Was/were*, Past Simple (irregular), dates/years
Week 10	Past Simple (regular), Past Simple questions/negatives, *ago*
Week 11	*Can/can't*, adverbs of manner; Stop and Check 3
Week 12	Countable/uncountable, *like* vs *would like*, food vocabulary
Week 13	Present Continuous, Present Simple vs Continuous
Week 14	Future plans, revision; Stop and Check 4
Week 15	Progress tests, revision activities, end-of-course assessment

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	New Headway Beginner Level	Yes
Recommended Texts		
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	**Democracy and Human Rights**			**Module Delivery**	
Module Type	Support			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	QU02				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		1	**Semester of Delivery**		1
Administering Department		ECE	**College**	ENG-QU	
Module Leader	Hussam aziz matshar		**e-mail**	hussam.aziz@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ms.C.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Dr. Musa H. Wali	**e-mail**	musa.h.wali@qu.edu.iq	
Scientific Committee Approval Date		01/06/2023	**Version Number**	1.0	

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

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

Module Aims أهداف المادة الدراسية	1: - Spreading the culture of love for the homeland and the people of the homeland and sowing the seeds of peaceful coexistence and living in dignity for all 2003. 2: - Focusing on the national identity and respecting it and working on its principles. 3: - Consolidating the principles of democracy and respecting them and working on their maturation. 4: - Raise a generation and believe in the values of tolerance, pluralism and difference, respecting human dignity and activating the mind, thinking and creativity. 5: - Spreading the culture of accepting the other, respecting his privacy, and the city of Jerusalem. 6: - Collecting cooperation with state institutions in order to extend security and safety throughout the dear country.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**By the end of the module, students should be able to:** 1. 1. The ability to understand and apply the basic concepts and principles of democracy. 2. 2. The ability to participate in humanitarian and social activities that stimulate empathy with people. 3. 3. The ability to solve the most important problems related to the rights and freedoms of individuals. 4. 4. The ability to apply knowledge in the humanities. 5. 5. Extensive participation in political elections and an active national presence in them. 6. 6. The ability to solve the most important problems related to the rights and freedoms of individuals. 7. 7. The ability to involve students in humanitarian and social activities that stimulate empathy with people.
Indicative Contents المحتويات الإرشادية	Upon completion of the module, students will be able to: 1- Enabling students with the skills aimed at upholding the principles of democracy, affirming the values and patterns of thinking that affirm the same rights for all, and encouraging action to defend those rights. 2- Not delving into contentious issues and focusing on consolidating the national identity for all.

	3- Possessing a general culture that enables them to delve into political issues, the way to reach power, ways to appeal, and the joints and pillars of the democratic system. industry. production systems.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in introducing this unit is 1- Encouraging students to participate in discussions, while improving and expanding their critical thinking skills. 2- The various activities carried out by the professor and the involvement of students in these activities. 3- Showing a group of documentaries introducing the principles of democracy. 4- Carrying out some scientific trips, such as visiting the High Electoral Commission.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Understanding the concept of democracy.
Week 2	Introducing the intellectual foundations of democracy.
Week 3	Learn about the Islamists' view of democracy
Week 4	Identify the characteristics of the democratic style + the elements of democracy.
Week 5	What is the opposition?
Week 6	Types of opposition.
Week 7	first month exam.
Week 8	The general pillars of democracy (the first pillar / respect for human rights, the second pillar / political pluralism, the third pillar / the peaceful and legitimate transfer of power).

Week 9	The general pillars of democracy (the fourth pillar / political equality, the fifth pillar / respect for the majority principle, the sixth pillar / the existence of the rule of law).
Week 10	Definition of the types of democracy (direct democracy, semi-direct democracy, representative democracy)
Week 11	Introducing the types of democracy (participatory democracy, liberal democracy, consensual democracy, majority democracy, plurality democracy, delegated democracy, social democracy, industrial democracy, deliberative democracy).
Week 12	Historical development of democracy in Iraq
Week 13	Democracy according to the permanent Iraqi constitution for the year (2005) (Al-Haqooq).
Week 14	Democracy according to the permanent Iraqi constitution for the year (2005) (Hurriyat).
Week 15	second month exam
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Sindhi, Naz. Badrakhan. (2012). Human rights and democracy. College of Education, Ibn Rushd for Human Sciences, University of Baghdad.	No
Recommended Texts	Dr. Maher Serbi Kazem, Human Rights, Democracy and Public Freedoms, 2nd edition, Baghdad: Al-Kitab Press, 2010	No
Websites	http://www.qu.edu.iq	

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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics II**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENG121**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		1	**Semester of Delivery**		2
Administering Department		ECE	**College**	Type College Code	
Module Leader	Kawthar Al-fatlawi		**e-mail**	Kawther.alfatlawi @qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name		Kawthar Al-fatlawi	**e-mail**	Kawther.alfatlawi @qu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mathematics I	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1.To understand the concept of multiple integrals, focusing on double integrals in Cartesian and polar coordinates. To understand voltage, current and power from a given circuit. 2.To introduce students to ordinary differential equations (ODEs). Students will learn the definition of ODEs, different types of ODEs, the module will also cover methods for solving ODEs. 3. To provide students with a comprehensive understanding of vector analysis. 4.To introduce the concept of sequences and series, various tests for convergence of series.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a deep understanding of multiple integrals, including the ability to evaluate double integrals in Cartesian and polar coordinates, as well as triple integrals in Cartesian and spherical coordinates. 2. Solve ordinary differential equations of various types, orders, and degrees, using analytical and numerical methods. 3. Apply vector analysis concepts, such as divergence and curl, to analyze vector fields and solve engineering problems related to fluid flow and electromagnetism. 4. Utilize Green's Theorem to evaluate line integrals over closed curves and connect them to double integrals over the corresponding regions. 5. Apply the Divergence Theorem to relate the flux of a vector field across a closed surface to the triple integral of the divergence of the field over the region enclosed by the surface. 6. Utilize Stokes' Theorem to evaluate line integrals of vector fields over closed curves and connect them to surface integrals of the curl of the field over the surface bounded by the curve. 7. Understand the concept of a sequence and apply limit theorems to determine the convergence or divergence of sequences. 8. Apply various tests, such as the comparison test, integral test, ratio test, and root test, to determine the convergence of infinite series, and analyzing and manipulate power series, including determining their radius and interval of convergence. 9. Understand the concept of Fourier series, analyze the properties of periodic functions, and apply Fourier series in engineering applications, such as signal processing and harmonic analysis. 10. Understand the concept of Fourier transform and its relationship to the time and frequency domains, and apply Fourier transform techniques to analyze signals and systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A -

	Double integrals in Cartesian coordinates: evaluation techniques, change of order of integration, applications. Double integrals in polar coordinates: conversion formulas, evaluation techniques, applications. Triple integrals in Cartesian coordinates: evaluation techniques, applications. Triple integrals in spherical coordinates: conversion formulas, evaluation techniques, applications. Definition and classification of ordinary differential equations (ODEs). First-order ODEs: separable, linear, and exact equations. Higher-order ODEs: linear homogeneous and non-homogeneous equations. Solution techniques: integrating factors, variation of parameters, undetermined coefficients. Vector functions: definitions, limits, continuity. Divergence and curl of vector functions: definitions, properties, applications. Green's Theorem: statement, proof, applications. Surface integrals: definition, parametrization, evaluation techniques.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	the strategy aims to foster a deep understanding of the mathematical concepts and techniques involved in multiple integrals, ordinary differential equations, vector analysis, sequences and series, and Fourier analysis. It provides a balanced approach between theory and applications, preparing students for engineering applications and further studies in related fields.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	80	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	27% (27)	5, 9,13	LO # 1 - 9
	Assignments	1	10%(10)	Continue	All
	Projects	-	0% (0)		
	Report	1	3% (3)	12	All
Summative assessment	**Midterm Exam**	1	10% (10)	8	LO # 1-5
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Multiple Integral: Double integral: Cartesian coordinate, polar coordinate
Week 2	Triple Integral: in Cartesian coordinate, spherical coordinate.
Week 3	Ordinary Differential Equations, Definition, Type, Order, Degree, Solution of Differential equation
Week 4	Vector analysis: Diverge and curl of vector function, Green's Theorem, Surface integer
Week 5	Divergence Theorem, Stock's Theorem,
Week 6	Engineering application.

Week 7	Mid Exam
Week 8	Sequence & Series: Definition of sequence number, Limit Theorem, definition of infinite series.
Week 9	Sequence of Series: Test of converge (comparison test, integral test, Ratio test, Root test),
Week 10	Fourier series: Periodic function, Harmonic Fourier series, Even & odd function.
Week 11	Exponential form of Fourier series, Engineering applications
Week 12	Fourier transform: Definition of FT, Fourier transform of different time domain function.
Week 13	Invers of Fourier Transform.
Week 14	Engineering application.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	THOMAS' CALCULUS TWELFTH EDITION	Yes
Recommended Texts		
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
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Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Static Mechanics**			**Module Delivery**	
Module Type	B			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENG122**				
ECTS Credits	**3**				
SWL (hr/sem)	75				
Module Level		1	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Mr. Hayder Dheyaa Alsoufi		**e-mail**	hayder.alsoufi@qu.edu.iq	
Module Leader's Acad. Title		Assistant Lecture	**Module Leader's Qualification**		MSc
Module Tutor			**e-mail**	hayder.alsoufi@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		11/10/2026	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	To provide students with a fundamental understanding of the basic principles of engineering mechanics and their applications in engineering practice. It seeks to develop knowledge of statics, force resultants, and equilibrium of force systems, while introducing essential concepts of strength of materials and simple stress. The module also aims to familiarize students with the fundamental principles of thermodynamics, including the first law, and provide an introductory understanding of heat transfer. Furthermore, it seeks to strengthen students' analytical thinking, quantitative reasoning, and problem-solving abilities through the application of basic engineering concepts to practical problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental principles of statics and the concept of force resultants. 2. Analyze simple force systems and determine equilibrium conditions in one dimension. 3. Define basic concepts and terminology related to the strength of materials. 4. Explain the concept of simple stress and perform basic stress calculations. 5. Identify and explain fundamental thermodynamic concepts and definitions 6. Explain the first law of thermodynamics and apply it to basic problems. 7. Describe the fundamental principles and basic modes of heat transfer. 8. Apply fundamental engineering principles to solve introductory problems involving statics, stress, thermodynamics, and heat transfer.
Indicative Contents المحتويات الإرشادية	A. Principles of Statics and Resultants Introduction to the fundamental principles of statics and their role in engineering mechanics. Definition of forces, characteristics of force systems, and methods of representing forces. Study of force resultants and the techniques used to determine the equivalent resultant for simple force systems. B. Equilibrium of Force Systems in One Dimension Explanation of the fundamental conditions required for force equilibrium. Analysis of one-dimensional force systems using basic equilibrium equations. Application of equilibrium principles to simple engineering problems involving forces acting along a single axis. C. Fundamental Concepts of Strength of Materials Introduction to the principles of strength of materials and the behavior of engineering materials under applied loads. Explanation of key terms, including external loads, internal forces, deformation, and material response. Introduction to the relationship between applied loads and the mechanical behavior of structural and engineering components. D. Simple Stress Definition of stress and its importance in engineering applications. Introduction to normal (axial) stress resulting from axial tension and compression forces. Calculation of simple stress using applied loads and cross-sectional areas, with applications to basic engineering components. E. Thermodynamics: Concepts and Definitions Introduction to fundamental thermodynamic concepts and terminology. Explanation of thermodynamic systems, surroundings, and boundaries, as well as the distinction between closed and open systems. Introduction to fundamental thermodynamic properties—including pressure, temperature, volume, and energy—and their significance in engineering applications.

	F. The First Law of Thermodynamics Introduction to the principle of conservation of energy and its application to thermodynamic systems. Explanation of heat transfer, work, and changes in internal energy. Application of the First Law of Thermodynamics to simple engineering problems involving energy exchanges and basic thermodynamic processes. G. Heat Transfer Introduction to the principles and fundamental mechanisms of heat transfer. Explanation of the three primary modes of heat transfer: conduction, convection, and radiation. Introduction to factors affecting heat transfer rates and the application of fundamental heat transfer principles to simple engineering problems.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main teaching strategy is to develop students' understanding of fundamental engineering principles through lectures, worked examples, guided problem-solving, and classroom discussions. Students will be encouraged to participate actively in analyzing engineering problems, applying relevant equations, interpreting results, and relating theoretical concepts to practical engineering applications. Tutorial exercises and formative assessments may be used to reinforce understanding and improve analytical and critical-thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٥٠	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٢٥	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٢
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	٧٥		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10	٣, ٦, ٩, ١٢	MLO1, MLO2, MLO3, MLO5, MLO7
	Assignments	4	20	4, 7, 11, 13	MLO1, MLO2, MLO4, MLO6, MLO8
	Projects / Lab.	N/A	N/A	N/A	N/A
	Report	1	10	Week ١٤	MLO3, MLO4, MLO7
Summative assessment	**Midterm Exam**	1	10	Week 8	,MLO١, MLO٢, MLO٣ MLO٤
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Engineering Mechanics and Principles of Statics
Week 2	Forces and Resultants
Week 3	Equilibrium of Force Systems in One Dimension
Week 4	Applications of Force Equilibrium
Week 5	Introduction to Strength of Materials: Basic Definitions
Week 6	Simple Stress: Concepts and Definitions
Week 7	Simple Stress: Basic Calculations and Applications
Week 8	Midterm Exam
Week 9	Thermodynamics: Basic Concepts and Definitions
Week 10	Thermodynamic Systems and Properties
Week 11	The First Law of Thermodynamics
Week 12	Applications of the First Law of Thermodynamics
Week 13	Introduction to Heat Transfer
Week 14	Conduction, Convection, and Radiation
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	١. Meriam, J. L., Kraige, L. G., and Bolton, J. N. (2008). ٢.Engineering Mechanics: Statics (5th ed.). Wiley. ٣. Pytel, A., and Singer, F. L. (1987). Strength of Materials (4th ed.). Harper & Row. ٤. Holman, J. P. (2010). Heat Transfer. (10th ed.). McGraw-Hill.	Yes
Recommended Texts	Hibbeler, R. C. (2017). Mechanics of Materials (10th ed.). Çengel, Y. A., and Boles, M. A. (2019). Thermodynamics: An Engineering Approach. McGraw-Hill.	No
Websites	https://api.pageplace.de/preview/DT0400.9781292178288_A31720168/preview-9781292178288_A31720168.pdf https://mechfamily-ju.com/storage/images/files/file_1731348320KJr7n.pdf	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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	**Workshop Technology**			**Module Delivery**	
Module Type	Basic			☐ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	ENG123				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level	1		**Semester of Delivery**	2	
Administering Department	ECE		**College**	ENG-QU	
Module Leader	Hasan Hamid Naji		**e-mail**		
Module Leader's Acad. Title	Assis. Professor		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Iyad Hamid Abid		**e-mail**	iyad.alumari@qu.edu.iq	
Peer Reviewer Name	Dr. Musa H. Wali		e-mail	musa.h.wali@qu.edu.iq	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	1. Students will demonstrate the ability to use electrical measuring devices.

أهداف المادة الدراسية	2. Students will demonstrate their ability to calculate the values of the resistors from their colors. 3. Students will understand the use of different types of electrical switches. 4. Students will demonstrate their ability to check for electrical capacitance. 5. Students will demonstrate the ability to use connection boards. 6. Students will demonstrate the ability to number the terminals of integrated circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Know the use of different electrical measuring devices. 2. Use electric caustic soldering knowledge. 3. Use connection boards to connect electronic circuits. 4. Calculating the values of electrical resistors from their colors, methods of measuring them, and connecting their circuits in series and parallel. 5. How to check capacitators in different methods, replace them, and connect their circuits in series and parallel 6. Use different electrical switches in electronic circuits. 7. How to use, check, and replace different fuses 8. Knowledge of semiconductor elements (diode and transistor) 9. Learn the numbering of the terminals of the integrated circuits 10. Read electronic printed circuit board and track faults. 11. Design and connection of electronic circuits on connecting boards
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Electrical measuring devices (multimeters, oscilloscopes, power supply), Electrical caustic soldering, reading values of resistors from their colors and methods of measuring them - connecting resistors in series and in parallel - methods of checking capacitances - types of electrical switches - checking electrical coils - semiconductor elements - numbering the ends of integrated circuits - connection boards

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

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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, 10	LO #1, 2, 8 and 9
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 10 and 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	How to use the different measuring devices in the workshop such as (mustimeter - oscilloscope -power supply)
Week 2	How to use caustic, types of caustic used in the workshop, and training on caustic soldering.
Week 3	Connection Boards- Vero board , Bread board , PCB
Week 4	Types of resistors and methods of measuring and coding them
Week 5	Connect resistors in series and parallel, and check the electrical circuits.
Week 6	The different types of capacitors in terms of the type of insulator used between the capacitor panels, the voltage that the capacitor bears, and reading the capacitance values in different ways in coding. How to check capacitors and how to replace them.
Week 7	Making circles to connect the capacitators in parallel and series on the connecting boards.
Week 8	The different types of electric switches used in electronic devices and methods of their examination, the current that each electric switch bears, and the use of each type.
Week 9	Types of fuses used in electronic circuits Types and diameters of wires used in fuses, the current borne by each type, and how to repair fuses.
Week 10	Electrical coils, their types, methods of examination, uses, identification of faults, reading the types of files that use color codes in numbering, electrical transformers, their types, examination, determining the type of transformer, self-transformers, and the difference between a self-transformer and a regular transformer.
Week 11	The different types of semiconductors (diode, transistor, ... etc) in terms of how they are manufactured and the materials used in their manufacture, the methods used in numbering them, finding equivalents.
Week 12	The different types of semiconductors (diode, transistor ... etc) transistors and idle diodes for a group of them.

Week 13	Identify the numbering of the parties for several types of integrated electronic circuits, how to manufacture these circuits, and the components involved in manufacturing.
Week 14	How to read printed circuit boards and how to track faults to locate faults and causes of malfunction.
Week 15	Design of electronic circuits on the connection board and insert electronic components on it; how to solder these components (simple circuit).

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Experiments sheets	Yes
Recommended Texts		
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	**Digital Technologies**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE124**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Type College Code	
Module Leader	Alaa Abdulhussain Refeis		**e-mail**	alaa.refeis@qu.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			**e-mail**		
Scientific Committee Approval Date	01/06/2026		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** Knowledge of Boolean algebra operations, including simplifying Boolean expressions. **2.** Understanding the method of using Karnaugh maps to simplify logical expressions. **3.** Understanding the use of Karnaugh maps to simplify logical expressions with five variables. **4.** Knowledge of implementing combinational logic and performing code conversion. **5.** Understanding the general characteristics and applications of NAND and NOR gates. **6.** Understanding fundamental arithmetic operations using digital adder and parallel adder circuits, as well as the functions of comparison circuits, decoding circuits, and code conversion circuits. **7.** Understanding the functions and applications of flip-flops in digital circuits, including related processes.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** The ability to analyze and simplify various types of logic gates using Boolean algebra. **2.** Ability to use Karnaugh maps for logical simplification and reduction of variables. **3.** Ability to implement harmonic logic using logic gates, including NAND and NOR gates. **4.** Ability to perform basic arithmetic operations and design tools for addition and comparison. **5.** Ability to design and implement transducers and decoders. **6.** Ability to understand the operation and design of sequential circuits and their applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Boolean algebra operations, expressions and variables related to it, analysis of logical gates using Boolean algebra. Using Karnaugh's map to simplify equations of Boolean algebra, using the Karnaugh's map to simplify expressions containing five variables. Use of combinational logic. Exploring the universal properties of NAND and NOR gates. Digital adder and parallel adder circuits fundamentals. Digital circuits for comparison, coding, decoding, conversion, and parity check.

	Basics of Multiplexer and Demultiplexer circuits, Fundamentals of sequential logic gates. Fundamentals of flip-flop circuits and their various types (SR, JK, D, T, and Master-Slave).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will focus on encouraging active student participation in exercises to refine and expand their critical thinking skills. The module will utilize classes, interactive tutorials, and simple experiments involving sampling activities to engage and interest students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**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, 10	LO #1, 2, 5 and 6
	Assignments	2	10% (10)	2, 12	LO # 2, 3, 4 and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 3, 4 and 5
Summative assessment	**Midterm Exam**	2 hr.	10% (10)	7	LO # 1-5
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Number Systems, Operations, and Codes**
Week 2	**Number Systems, Operations, and Codes**
Week 3	**Boolean algebra operations and expressions**
Week 4	**Boolean analysis of logic gates**
Week 5	**Karnaugh map, SOP minimization**
Week 6	**Karnaugh map, POS minimization**
Week 7	**Universal properties of NAND and NOR gates**
Week 8	**Mid-term - Basic adder and parallel adder**
Week 9	**Comparator, decoder, and encoder**
Week 10	**Code converter and parity**
Week 11	**Multiplexer and Demultiplexer**
Week 12	**Encoder and Decoder**
Week 13	**7 segment display decoders**
Week 14	**Implementation of combinational logic**
Week 15	**Introduction to sequential circuits**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Lab 1: Logic gates I**
Week 2	**Lab 2: Logic gates II**
Week 3	**Lab 3: Boolean Algebra I**
Week 4	**Lab 4: Boolean Algebra II**
Week 5	**Lab 5: Karnaugh Map I**
Week 6	**Lab 6: Karnaugh Map II**
Week 7	**Mid-term exam**
Week 8	**Code conversion I**
Week 9	**Code conversion II**
Week 10	**Basic arithmetic operation I**
Week 11	**Basic arithmetic operation II**
Week 12	**Comparators I**
Week 13	**Comparators II**
Week 14	**Decoders and encoders**
Week 15	**Multiplexer & Demultiplexer**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Fundamentals, 11th Edition	Yes
Recommended Texts	Digital Design with Introduction to the Verilog HDL	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electrical Circuits II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE 125**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level		**1**	**Semester of Delivery**		**2**
Administering Department		**Type Dept. Code**	**College**	**Collage of Engineering**	
Module Leader	**Fahad Ahmed Al-Amyal**		**e-mail**		
Module Leader's Acad. Title		**Lecturer**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor	**Name (if available)**		**e-mail**	**fahad.alamyal@qu.edu.iq**	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		**01/06/2025**	**Version Number**		**1.0**

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**This course aims to:** **1. Introduce fundamental concepts of alternating current (AC) circuit analysis, sinusoidal waveforms, average, and RMS values.** **2. Develop mathematical and phasor representations using complex numbers and the j-operator for AC circuit evaluation.** **3. Analyze single-phase series and parallel AC circuits containing resistors, inductors, and capacitors (RLC circuits).** **4.To equip students with the ability to analyze and solve AC circuits using various techniques (From Electric circuit I).** **5. Examine active, reactive, apparent power, and power factor in single-phase AC networks.** **6. Investigate series and parallel resonance phenomena, quality factor (Q-factor), and bandwidth characteristics.** **7. Provide practical laboratory training on AC measuring equipment, oscilloscope operation (CRT), and experimental verification of AC circuit theorems.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**By the end of this module, students should be able to:** • **LO1: Calculate average, effective (RMS) values, peak factors, and phase relationships for sinusoidal AC waveforms.** • **LO2: Express alternating quantities using phasor notation, complex numbers, and the j-operator.** • **LO3: Analyze single-phase AC series, parallel, and series-parallel RLC circuits to calculate impedance, admittance, currents, and voltages.** • **LO4: Evaluate real power (P), reactive power (Q), apparent power (S), and power factor in AC networks.** • **LO5: Determine resonance frequencies, bandwidth, and quality factors for series and parallel resonant circuits.** • **LO6: Apply basic concepts to solve balanced three-phase circuit configurations (Star and Delta connections).** • **LO7: Operate AC laboratory equipment (oscilloscopes, signal generators, AC meters) to measure voltage, current, frequency, and phase shift safely and accurately.**
Indicative Contents المحتويات الإرشادية	**This module presents the foundational principles and analysis techniques for alternating current (AC) electrical networks.** **It covers sinusoidal AC waveforms, angular frequency, period, peak, average, and Root-Mean-Square (RMS) values. Phasor representation, complex algebra, and the j-operator notation are introduced for single-phase circuit evaluation.** **The course investigates impedance, admittance, phase angles, and phasor diagrams for series, parallel, and series-parallel RLC circuits. AC power concepts—including average active power, reactive power, complex power, and apparent power—are thoroughly explored.**

	Frequency response and resonance phenomena are examined in detail, covering series resonance, parallel resonance, resonant frequency equations, selectivity, bandwidth, and Quality Factor (Q-factor). An introduction to fundamental balanced three-phase system connections (Wye/Star and Delta) is also provided. **The practical laboratory component focuses on hands-on training with AC test equipment (Cathode Ray Oscilloscopes / CRTs, function generators, digital multimeters), testing series/parallel RLC networks, measuring frequency response curves, testing series/parallel resonance, and experimental evaluation of 3-phase star and delta resistive circuits.**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**The teaching approach for this module integrates theoretical foundations with practical laboratory experiments and interactive problem-solving techniques:** **• Interactive Lectures: Explaining sinusoidal AC principles, phasor concepts, complex power, and 3-phase systems using whiteboard demonstrations and multimedia tools.** **• Practical Laboratory Work: Direct hands-on testing using Cathode Ray Oscilloscopes (CRT), function generators, and measuring instruments to verify AC series/parallel circuits, resonance, and 3-phase connections.** **• Tutorial Sessions: Directed problem-solving workshops focusing on AC circuit calculations, phasor diagrams, and complex algebra under the instructor's guidance.** **• Self-Directed Study & Homework: Regular individual assignments to enhance analytical skills, circuit simplification techniques, and deep understanding.** **• Continuous Assessment & Quizzes: Frequent short evaluations, laboratory report reviews, and active classroom participation monitoring.**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**95**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**7**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**80**	**Unstructured SWL (h/w)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	**4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	15% (15)	2, 5, 9, 12	LO1, LO2, LO3, LO5
	Assignments & HomeWorks	4	10% (10)	2, 5, 9, 12	LO1–LO6
	Laboratory Reports & Performance	All weeks	10% (10)	Continuous	LO7
	Class Attendance & Participation	1	5% (5)	Continuous	All LO1–LO6
Summative assessment	Midterm Exam	2 hr.	10% (10)	7	LO1–LO6
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Basic concepts of ac circuit
Week 2	Average and RMS values
Week 3	Phasor representation of ac quantities
Week 4	Single phase ac circuit
Week 5	Series ac circuit
Week 6	Parallel ac circuit
Week 7	Mid-term Exam
Week 8	Power in ac circuit
Week 9	Representation of ac circuit by J operator
Week 10	Analysis of ac circuit
Week 11	Series resonance
Week 12	Parallel resonance
Week 13	Introduction to transient conditions
Week 14	Introduction to 3ph circuits
Week 15	Cont. 3ph circuits
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	**Introduction to ac equipment**
Week 2	**Cathode Rau Tube I**
Week 3	**Cathode Rau Tube II**
Week 4	**Testing series ac circuit I**
Week 5	**Testing series ac circuit II**
Week 6	**Testing parallel ac circuit I**
Week 7	**Mid-term Exam**
Week 8	**Testing parallel ac circuit II**
Week 9	**Frequency response of ac circuit I**
Week 10	**Frequency response of ac circuit II**
Week 11	**Testing series resonance**
Week 12	**Testing parallel resonance**
Week 13	**Maximum power transfer**
Week 14	**Testing simple 3ph circuit (star connection resistive load)**
Week 15	**Testing simple 3ph circuit (delta connection resistive load)**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Introductory Circuit Analysis by Boylestad**	**Yes**
Recommended Texts	**1. Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education** **2. DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.**	**No**
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer 1**			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**QU04**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		1	**Semester of Delivery**		2
Administering Department		**ECE**	**College**	ENG-QU	
Module Leader	Aqeel Lateef Khudhair		**e-mail**	aqeel.attaby@qu.edu.iq	
Module Leader's Acad. Title		lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to equip students with fundamental computer skills and knowledge, providing them with a comprehensive understanding of computer hardware, software, and basic computing operations. The course will: 1. Enable students to use computers for essential tasks and operations. 2. Familiarize students with computer hardware components and their functions. 3. Teach students how to create and format documents using word processing software, as well as how to develop presentations. 4. Guide students in conducting effective research using the Internet and related tools. 5. Introduce students to the concepts and applications of Artificial Intelligence (AI) and its relevance in everyday life.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Utilize the computer for fundamental tasks such as creating and managing documents, presentations, and basic data processing. 2. Identify and explain the functions of various computer hardware components, including input/output devices, memory, and CPU. 3. Create, format, and manipulate text documents using word processing software, including tasks like spell-check, table handling, and document printing. 4. Create and manage spreadsheets, perform basic calculations, and utilize formulas and functions for data manipulation. 5. Design and deliver presentations using presentation software, manage slide shows, and prepare handouts. 6. Conduct research on the Internet, using search engines and web browsers efficiently to find relevant information. 7. Understand basic networking concepts and demonstrate the ability to connect and configure devices. 8. Send and manage emails effectively, including the use of email attachments and document collaboration tools. 9. Troubleshoot common hardware and software issues, applying basic problem-solving techniques to resolve typical computer-related problems. 10. Demonstrate an understanding of Artificial Intelligence (AI), its history, applications, and ethical considerations.

Indicative Contents المحتويات الإرشادية	1-Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting (2 hr Theoretical ,2 hr Practical) 2-E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking(2 hr Theoretical ,2 hr Practical) 3-Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.(4 hr Theoretical, 4 hr Practical) 4-Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.(4 hr Theoretical ,4 hr Practical) 5-Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant.)(4 hr Theoretical and 4 hr Practical) 6-Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising. (6 hr Theoretical and 6 hr Practical) 7-Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity.)(2 hr Theoretical and 2 hr Practical) 8-Ethical Challenges in Al: (Al ethics, privacy and surveillance, the impact of Al on the job market.) (2 hr Theoretical and 2 hr Practical) 9-The Future of Al (Future trends in Al, recent research and emerging technologies.) (2 hr Theoretical and 2 hr Practical)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course will use the following teaching and learning methods • Board (Normal or Smart) • Computers • Presentation software such as PowerPoint

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	40	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	35	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Number	**Marks**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2 and 3
	Online Assignments (واجبات بيتية)	1	10% (10)	2, 12	LO #1, 2 and 3
	Assignments Onsite (واجبات صفية)	1	10% (10)	4, 11	LO # 5, 8 and 10
	Report	1	10% (10)	13	LO #1, 2 and 3
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting.
Week 2	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking.
Week 3	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 5	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 6	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 7	Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant.
Week 8	Mid-term Exam
Week 9	Applications of Al: Education, Healthcare.
Week 10	Applications of Al: Finance, Transportation.
Week 11	Applications of Al:Marketing and Advertising.
Week 12	Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity).
Week 13	Ethical Challenges in Al: (Al ethics, privacy and surveillance, the impact of Al on the job market).
Week 14	The Future of Al (Future trends in Al, recent research and emerging technologies).
Week 15	final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting
Week 2	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking
Week 3	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 5	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 6	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 8	Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant.
Week 9	Mid-term Exam
Week 10	Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising.
Week11	Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity.)
Week 12	Ethical Challenges in Al: (Al ethics, privacy and surveillance, the impact of Al on the job market.)
Week 13	The Future of Al (Future trends in Al, recent research and emerging technologies.)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd Edition (2020)	No
Recommended Texts	1. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology In Action Complete,"16th Edition.2020 2. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition. 2020	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	**Mathematics III**			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENG211**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		2	**Semester of Delivery**		3
Administering Department		ECE	**College**	ENG-QU	
Module Leader	M.Sc. Safaa Abbood Kadhim		**e-mail**	safaa.abbood@qu.edu.iq	
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		Scientific Committee	**e-mail**		
Scientific Committee Approval Date			**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	ENG121-Math2	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Identify matrices. 2. Studying Vector recognition. 3. Know how to convert from the Cartesian system to the polar system. 4. Know how to find areas and draw different functions in the polar system. 5. Identify the solution of repeated series and strings in the manner of Tyler.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand and know the solution of mathematical problems 2. Recognize symbols and write down mathematics. 3. Develop the student's skills in using matrices, finding the determinant and solving mathematical equations. 4. Develop abstract, logical and critical thinking and the ability to think decisively about their work and the work of others.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Matrices Learn about the types of matrices. [9 hrs] Studding the matrices and different operation and matrices algebras. [12 hrs] Part B – Vectors and the Geometry of Space Studding the vectors and its properties and geometry of space and planes and polar coordinates . [18 hrs] Part C – Graphing in Polar Coordinates Identify the Graphing in Polar Coordinates and understanding the Applications on Polar Coordinates [18 hrs] Part D – Introduction to Infinite Sequences Studding the Infinite Sequences, and Series Tests, Power Series Taylor Series and Maclaurin Series [18 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Diction method 2. Dialogic method 3. The active method (depends on the student's activity)

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	10	**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**	3	27% (27)	5, 9,13	LO # 1 - 9
	Assignments	1	10%(10)	Continue	All
	Projects	-	0% (0)		
	Report	1	3% (3)	12	All
Summative assessment	**Midterm Exam**	1	10% (10)	8	LO # 1-5
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Matrices algebra.
Week 2	Transpose, determinate and inversion of matrix
Week 3	Solution of system of linear equations
Week 4	Vector algebra
Week 5	Dot and cross product
Week 6	Lines and Planes in Space, Polar Coordinates.
Week 7	Mid-term Exam
Week 8	Equations Relating Polar and Cartesian Coordinates
Week 9	Graphing in Polar Coordinates
Week 10	Applications on Polar Coordinates
Week 11	Infinite Sequences
Week 12	Series Tests
Week 13	Power Series
Week 14	Taylor Series and Maclaurin Series
Week 15	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	THOMAS' CALCULUS TWELFTH EDITION	Yes
Recommended Texts	None	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	**Electronics I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE212**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Israa Amer Dahham		**e-mail**	Esraa.daham@qu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2025		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE225 – Electronic II	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** To understand the basic concepts of electronic circuits. **2.** To Understanding the applied experimental skills the student acquired in the laboratories. **3.** To Understanding and analyzing the structure of electronic devices. **4.** To Understanding the operating principles of integrated circuits (ICs). **5.** To Understanding the specifications and standards of commercially available devices that are locally and globally certified (data sheets). **6.** To Understanding the fundamentals of designing and simulating certain electronic circuits
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Ability to design and trace electronic circuits (schematic diagrams). **2.** The ability to analyze the structure of electronic devices and the operating principles of integrated circuits. **3.** Ability to use testing and measuring equipment. **4.** The ability to program, design, and maintain electronic circuit boards
Indicative Contents المحتويات الإرشادية	-Indicative content includes the following: -Introduction to the application of occupational safety standards, covering their implementation and specific characteristics regarding electronic devices design and functionality. -Ability to work in a team -Exploring and assessing economic feasibility, where students will learn how to calculate quantities within Bills of Quantities. -Analyzing and implementing various applications of electronic components. -Study of practical applications of integrated circuits.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will focus on encouraging active student participation in exercises to refine and expand their critical thinking skills. The module will utilize classes, interactive tutorials, and simple experiments involving sampling activities to engage and interest students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	110	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Semiconductor Diode, Ideal versus Practical.
Week 2	Resistance Levels, Diode Equivalent Circuits., quiz
Week 3	Transition and Diffusion Capacitance, Reverse Recovery Time, Diode Specification Sheets, Diode Testing, Zener Diodes, Light- Emitting Diodes.
Week 4	Load-Line Analysis, Series Diode Configuration. Parallel and Series- Parallel Configurations, AND/OR

	Gates.
Week 5	Half-Wave Rectification, Full-Wave Rectification.
Week 6	Clippers, Clampers , examples
Week 7	Zener Diodes. Voltage-Multiplier Circuits.
Week 8	Mid-term Exam.
Week 9	BIT Transistor Construction and Operation, Common-Base Configuration, Common- Emitter Configuration, Common-Collector Configuration.
Week 10	Transistor Testing, Operating Point (Q Point). Fixed-Bias Configuration.
Week 11	Emitter-Bias Configuration, Voltage- Divider Bias Configuration.
Week 12	Collector Feedback Configuration, Emitter Follower Configuration, Common-Base Configuration.
Week 13	Miscellaneous Bias Configurations.
Week 14	Design Operations, Transistor Switching Networks, Bias Stabilization.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Review & Introduction to Lab.
Week 2	Lab 1: Semiconductor Diode Characteristics.
Week 3	Lab 1: Series-Parallel Diode Configurations.
Week 4	Lab 1: AC to DC Voltage Converter.
Week 5	Lab 1: Voltage-Doublers Circuit
Week 6	Lab 1: Clippers and Campers Circuits.
Week 7	Lab 1: Zener Diode Voltage Stabilizer.
Week 8	Lab 1: Common-Base Transistor characteristics.
Week 9	Mid-term Exam
Week 10	Lab 1: Common-Emitter Transistor characteristics.
Week 11	Lab 1: BJT Transistor Biasing Fixed-Bias.
Week 12	Lab 1: BJT Transistor Biasing Self-Bias.

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Electronic devices conventional current version seventh edition ,Thomas Floyd.	Yes
Recommended Texts	Electronic devices and circuit theory (Boylestad).	No
Websites	https://www.analoge devices courses and tutorials.	

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	**Digital Electronics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE213**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Alaa Abdulhussain Refeis		**e-mail**	alaa.refeis@qu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2025		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE124 – Digital Technology	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** To understand the basic concepts of sequential circuits, digital counters. **2.** To understand synchronous and asynchronous counters using flip-flops. **3.** To understand shift registers in digital circuits: Types, principles, and applications. **4.** To understand IC 555 timer and its applications in digital circuits. **5.** To know the design and analysis of analog-to-digital and digital-to-analog conversion circuits. **6.** To know the basics of programmable logic gates.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Ability to design and analyze synchronous and asynchronous counters using flip-flops. **2.** Ability to design and analyze shift registers and their applications in digital electronics. **3.** Ability to design and analyze analog-to-digital and digital-to-analog conversion circuits. **4.** Ability to program and design simple digital systems using programmable gates.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Introduction to asynchronous counters, covering their operation and characteristics. Synchronous counters, focusing on their design and functionality. Exploration of cascading counters and decoding counters, where students will learn how to connect multiple counters together and decode the output signals. Analysis and implementation of various types of shift registers, including SISO (Serial-In Serial-Out), SIPO (Serial-In Parallel-Out), PISO (Parallel-In Serial-Out), and PIPO (Parallel-In Parallel-Out). Study the practical applications of shift register counters. IC 555 Time, mode of operations, applications. Analog-to-digital conversion, digital-to-analog conversion.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will focus on encouraging active student participation in exercises to refine and expand their critical thinking skills. The module will utilize classes, interactive tutorials, and simple experiments involving sampling activities to engage and interest students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	110	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to digital electronics - sequential systems, flip flops
Week 2	Latches: SR and D, examples, quiz
Week 3	Flip-Flops, SR, JK, T, and D, edge-triggered SR. Control signals: Clear, Preset
Week 4	Flip-flops: Behavior tables, state diagrams, state equations, conversations between flip-flops
Week 5	Introduction - Asynchronous counters, Synchronous counters
Week 6	Analysis of clocked sequential circuits, examples
Week 7	Flip-flops excitation tables, design concepts
Week 8	Mid-term Exam, Counters: Introduction
Week 9	Counters: design synchronized counters, definitions, operations, examples
Week 10	Cascading counters and decoding counters, examples
Week 11	Shift registers counters: Ring counters, Johnson counters
Week 12	Basic shift register SISO, SIPO and PISO shift register
Week 13	PIPO and Bidirectional shift register, Shift register counter applications
Week 14	The 555 Timer, Input/Output and Peripheral Units
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Comparators
Week 2	Lab 1: Parity generators / checkers – part2
Week 3	Lab 1: Parity generators / checkers – part2
Week 4	Lab 2: Decoders & encoders – part1
Week 5	Lab 2: Decoders & encoders – part2
Week 6	Lab 3: Multiplexers & demultiplexers – part1
Week 7	Lab 3: Multiplexers & demultiplexers – part2
Week 8	Lab 4: Sequential logic circuits – part1
Week 9	Mid-term Exam
Week 10	Lab 4: Sequential logic circuits – part2

Week 11	Lab 5: Counters – part1
Week 12	Lab 5: Counters – part2

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Fundamentals, 11th Edition	Yes
Recommended Texts	Digital Design with Introduction to the Verilog HDL	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Network Analysis 1**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐**Seminar**	
Module Code	**ECE214**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		2	**Semester of Delivery**		3
Administering Department		ECE	**College**	Type College Code	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		Master
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Electrical circuits 1, Electrical circuit 2	**Semester**	1,2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Students will demonstrate the ability to model and analyze electrical circuit in time domain. 2. Students will understand the concept of self and mutual inductance. 3. Students will demonstrate the ability to analyze the first order RL and RC circuit. 4. Students will demonstrate the ability to calculate the time constant. 5. Students will demonstrate the ability to analyze the second order RLC circuit.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognizing the principles of energy storage elements. 2. Analysis the electrical network in different configurations. 3. Demonstration the ability to analyze the first order RL and RC circuits. 4. Demonstrate the ability to analyze the second order RLC circuit (Underdamping, Critical damping, and Overdamping).
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Energy Storage Elements– Capacitors, Inductors, Series and Parallel Capacitors, Series and Parallel Inductors, Resistor Inductor Capacitor (RLC) MAGNETICALLY COUPLED CIRCUIT– Self Inductance, Mutual Inductance, COUPLING COEFFICIENT (K), DOT DETERMINATION Natural of First Order RC and RL circuits, Transients Analysis, The Source Free RC Circuit, The Source Free RL Circuit, Time Constant Step Response of First Order RL and RC circuits- Step Response of First Order RC and RL circuits- transient response, steady-state response, complete response Second-Order Circuits- Finding Initial and Final Values, The Source-Free Series RLC Circuit, The Source-Free Parallel RLC Circuit, Step Response of a Series RLC Circuit, Step Response of a Parallel RLC Circuit, General Second-Order Circuits.

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**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, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.				
	Report				
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	70% (70)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Energy Storage Element
Week 2	Inductance
Week 3	Capacitance
Week 4	Mutual Inductance, Circuits with Mutual Inductance
Week 5	Series-Parallel Combinations
Week 6	Natural and Step Response of First Order RL and RC circuits
Week 7	Mid-exam
Week 8	Natural and Step Response of First Order RL and RC circuits
Week 9	Time Constant

Week 10	General solution of RLC Network
Week 11	General solution of RLC Network
Week 12	Sequential Switching
Week 13	Natural and Step Response of Second Order Series RLC circuits and general solution (Underdamped, Critically damped, Overdamped response)
Week 14	Natural and Step Response of Second Order Series RLC circuits and general solution (Underdamped, Critically damped, Overdamped response)
Week 15	Natural and Step Response of Second Order Series RLC circuits and general solution (Underdamped, Critically damped, Overdamped response)
	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	No
Recommended Texts		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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	**Electromagnetic Fields I**			**Module Delivery**	
Module Type	**Core**			☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ECE215**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		**2**	**Semester of Delivery**		**3**
Administering Department		**Type Dept. Code**	**College**	**Collage of Engineering**	
Module Leader	**Fahad Ahmed Al-Amyal**		**e-mail**		
Module Leader's Acad. Title		**Lecturer**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor	**Name (if available)**		**e-mail**	**fahad.alamyal@qu.edu.iq**	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		**01/06/2025**	**Version Number**		**1.0**

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**ENG121 – Engineering Mathematics II**	**Semester**	**2**
Co-requisites module	**ENG211 - Engineering Mathematics III**	**Semester**	**3**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**The main aims of this module are to:** **1. Introduce fundamental concepts of electromagnetic theory and its physical significance.** **2. Provide mathematical formulation of vector analysis in Cartesian, Cylindrical, and Spherical coordinate systems.** **3. Enable students to understand and apply Coulomb's Law and calculate Electric Field Intensity for various charge distributions.** **4. Analyze Electric Flux Density, Gauss's Law, and apply the Divergence Theorem in electrostatic problems.** **5. 5. Formulate concepts of work, potential difference, and electrostatic potential energy.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Upon successful completion of this module, students will be able to:** • **LO1: Perform vector operations (dot/cross products) and coordinate transformations across Cartesian, Cylindrical, and Spherical systems.** • **LO2: Calculate forces and electric field intensities produced by point, line, surface, and volume charge distributions.** • **LO3: Apply Gauss's Law to derive electric flux density for symmetric charge distributions.** • **LO4: Evaluate vector field divergence and apply the Divergence Theorem to electrostatic boundary regions.** • **LO5: Compute work done, potential difference, and absolute potential due to single and multiple charge systems.**
Indicative Contents المحتويات الإرشادية	**This module covers fundamental electrostatic theory and vector analysis. It starts with an introduction to electromagnetic wave characteristics, vector algebra, unit vectors, vector component operations, and dot and cross products. It then details Cartesian, Circular Cylindrical, and Spherical coordinate systems, along with differential surface and volume elements and coordinate transformations. The course proceeds to Coulomb's Law, electric field intensity, superposition principle, continuous charge distributions (line, surface, and volume), infinite line/sheet charges, and streamline equations. Furthermore, it explores electric flux density, Gauss's Law and its applications (point charges, line charges, coaxial cables), vector divergence, Maxwell's first equation in point form, and the Divergence Theorem. Finally, it concludes with energy, work done in electric fields, potential difference, and absolute electric potential due to point charges and continuous charge configurations.**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**The instructional approach for this module is structured to develop strong theoretical understanding and practical problem-solving skills in electromagnetics through:** **1. Interactive Face-to-Face Lectures: Delivering core mathematical derivations, theoretical concepts, physical interpretations, and vector operations using whiteboard and multimedia slides.** **2. Problem-Solving & Tutorial Sessions: Guiding students through analytical step-by-step solutions to engineering problems involving vector calculus, charge distributions, Gauss's Law, and electric potential calculations.** **3. Self-Directed Study & Homework Assignments: Assigning weekly problem sets and practice exercises to reinforce conceptual comprehension and independent analytical thinking.** **4. Formative Assessment & Discussion: Engaging students with short conceptual questions and quick diagnostic tests to provide immediate feedback on student understanding.**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**70**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**55**	**Unstructured SWL (h/w)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	**--**
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**	4	15% (15)	2, 5, 9, 12	LO #1, 2
	Assignments	2	10% (10)	3, 10	LO # 2, 3, and 5
	Homework	4	10% (10)	Continuous	All
	Seminar	1	5% (5)	13	LO # 4, and 5
Summative assessment	**Midterm Exam**	2 hr.	10% (10)	7	LO # 1-2
	Final Exam	2 hr.	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction & Vector Analysis: Introduction to electromagnetic fields and wave properties. Vector algebra, scalar and vector quantities, vector addition/subtraction, unit vectors, dot product, and cross product.**
Week 2	**Coordinate Systems & Transformations: Cartesian coordinate system (x, y, z). Circular Cylindrical coordinate system ($\boldsymbol{\rho}, \emptyset, \boldsymbol{z}$), differential volume/surface elements. Point and vector transformations.**
Week 3	**Spherical Coordinates & Vector Conversions: Spherical coordinate system ($\boldsymbol{r}, \boldsymbol{\theta}, \emptyset$), differential volume/surface elements. Vector transformations between Cartesian and Spherical systems, with illustrative examples.**
Week 4	**Coulomb's Law & Electric Field Intensity ($\overline{\boldsymbol{E}}$): Experimental law of Coulomb, permittivity of free space (ϵ_0), vector form of Coulomb's law. Definition of Electric Field Intensity and field of a single point charge.**
Week 5	**Superposition & Continuous Charge Distributions: Electric field due to multiple point charges (Superposition principle). Continuous volume charge density and total charge integration.**
Week 6	**Line & Surface Charge Distributions: Electric field intensity due to an infinite line charge ($\boldsymbol{\rho_L}$). Electric field intensity due to an infinite sheet of charge ($\boldsymbol{\rho_s}$). Combined field evaluations.**
Week 7	**Streamlines & Field Sketches: Concept of streamlines in two-dimensional fields, differential equation of streamlines, and solved examples**
Week 8	**Midterm Examination & Review of Coulomb's Law and Electric Field Intensity.**
Week 9	**Electric Flux Density & Faraday's Law: Faraday's concentric sphere experiment. Electric flux ($\boldsymbol{\psi}$) and Electric Flux Density ($\overline{\boldsymbol{D}}$). Relationship between $\overline{\boldsymbol{D}}$ and $\overline{\boldsymbol{E}}$in free space.**
Week 10	**Gauss's Law & Symmetrical Applications: Statement and mathematical formulation of Gauss's Law. Applications of Gauss's Law to symmetrical charge distributions (point charge, infinite line charge, coaxial cable).**
Week 11	**Differential Volume Element & Concept of Divergence: Applying Gauss's Law to an incremental volume element. Mathematical definition of Divergence. Divergence in Cartesian, Cylindrical, and Spherical coordinates.**

Week 12	**Maxwell's First Equation & Divergence Theorem: Maxwell's first equation in point/differential form. Del operator. Statement and evaluation of the Divergence Theorem.**
Week 13	**Work Done & Line Integrals in Electric Fields: Energy expended in moving a point charge in an electric field. Work done along specified paths and line integrals**
Week 14	**Electric Potential Difference & Absolute Potential (V): Definition of potential difference, Absolute potential of a point charge with zero reference at infinity. Potential field of a system of charges and continuous distributions. Relationship between $\overline{E}$ and V.**
Week 15	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 8th Edition, McGraw-Hill, 2012.**	Yes
Recommended Texts	**Elements of Electromagnetics, Matthew N. O. Sadiku, 7th Edition, Oxford University Press, 2018.**	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**The Crimes of the Baath Regime in Iraq**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**QU08**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	ECE		**College**	ENG-QU	
Module Leader			**e-mail**		
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	Scientific Committee		**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	To enlighten these generations, through an intellectual and documentary approach, about the crimes this Baathist regime committed against the Iraqi people. This curriculum includes keys of knowledge placed in the hands of the university student, with which to stand up to those who promote the Baath's lies and its false media.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Acquainting university youth with the crimes committed by an unjust regime in Iraq in particular, and their impact on the wider region and the whole world. 2. Examining the brutality of this regime through documents, photographs and dates, so that this generation can verify all the crimes committed against everyone who followed the path of truth and love of country and rejected the criminal Baathist approach.
Indicative Contents المحتويات الإرشادية	Teaching the university student how to confront false media, relying on the historical facts of the dictatorial rule that Iraq went through, and thus to confront any attempt to revive Baathist thought or to glorify it among young people

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy to be adopted in delivering this module will rely on: discussion, questioning, lecturing, worksheets, and allowing students to ask questions.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	4 and 9	LO #1, #2 and #7, #8
	Projects	1	10% (10)	10	LO #5, #6 and #9
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	8	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	The concept of crimes and their classifications
Week 2	Types of crimes
Week 3	Decisions issued by the court
Week 4	Psychological crimes
Week 5	Mechanisms of psychological crimes
Week 6	Effects of psychological crimes
Week 7	Militarization of society
Week 8	Midterm Exam
Week 9	The Baathist regime’s stance on religion
Week 10	Forms of human rights violations
Week 11	Prisons and detention sites of the Baath regime
Week 12	Destruction of cities and villages: the scorched-earth policy
Week 13	The events of the genocide mass graves committed by the regime
Week 14	Crimes of the mass graves
Week 15	The genocide mass graves dating back to the aforementioned events
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• The book “Crimes of the Baath Party in Iraq” /	Yes
Recommended Texts	• Ministry of Higher Education	Yes
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	**Mathematics IV**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENG221**				
ECTS Credits	**5**				
SWL (hr/sem)	**75**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ECE		**College**	Type College Code	
Module Leader	Kawthar Al-fatlawi		**e-mail**	Kawther.alfatlawi @qu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name	Kawthar Al-fatlawi		**e-mail**	Kawther.alfatlawi @qu.edu.iq	
Scientific Committee Approval Date	01/06/2025		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mathematics III	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** Identify functions. **2.** studying multiple integrals. **3.** Know how to integral in polar system. **4.** Know how to find triple integrals in the polar system. **5.** Identify the solution of first order differential equations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand and know the solution of mathematical problems 2. Recognize symbols and write down mathematics. 3. Develop the student's skills in using matrices, finding the determinant and solving mathematical equations. 4. Develop abstract, logical and critical thinking and the ability to think decisively about their work and the work of others
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Function of several variables Learn about the types of function, domain and range. Studding the partial derivative, chain rules and application on parietal derivatives. Part B – Multiple integrals Studding Multiple integrals and its properties, Double and iterated integrals over rectangular region and Double and iterated integrals over general region Part C – Double integral in polar coordinates Identify the integral in Polar Coordinates and understanding Application of double integrals, and Triple integrals Part D – Introduction to differential equation Studding the differential equation, and First order ordinary differential equation Solution of ordinary equation

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lecture Showing 2. Worked Examples 3. Interactive Lecture 4. Discussion-Based Learning

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	10	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.7
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**	3	27% (27)	5, 9,13	LO # 1 - 9
	Assignments	1	10%(10)	Continue	All
	Projects	-	0% (0)		
	Report	1	3% (3)	12	All
Summative assessment	**Midterm Exam**	1	10% (10)	8	LO # 1-5
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Function of several variables
Week 2	Partial derivatives
Week 3	The chain rule
Week 4	Application of partial derivatives
Week 5	Multiple integrals
Week 6	Double and iterated integrals over rectangular region
Week 7	Mid Exam
Week 8	Double integral in polar coordinates

Week 9	Application of double integrals
Week 10	Triple integrals
Week 11	Application of triple integrals
Week 12	Introduction to differential equation
Week 13	First order ordinary differential equation
Week 14	Solution of ordinary equation
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	THOMAS' CALCULUS TWELFTH EDITION	Yes
Recommended Texts		
Websites		

Grading Scheme

مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Network Analysis II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE 222				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ECE		**College**	ENG-QU	
Module Leader	Faris Asaad Abdulmunem		**e-mail**	faris.a.abdulmunem@qu.edu.iq	
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	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To understand the fundamental theory and purpose of the Laplace transform in converting differential equations from the time domain to the complex frequency (s-domain). 2. To master the mathematical definitions, properties, and graphical representations of unit step and impulse functions and their significance in system analysis. 3. To analyze the concept of poles and zeros and determine how their locations on the s-plane dictate system behavior and stability. 4. To apply the Laplace transform to transform electrical network components (R, L, C) into their s-domain equivalent models including initial conditions. 5. To define and derive the system transfer function H(s) as the ratio of the Laplace transform of the output to that of the input under zero initial conditions. 6. To evaluate the steady-state sinusoidal response of linear circuits using frequency-domain phasor equivalents derived from system functions. 7. To introduce the fundamental principles, transfer functions, and frequency characteristics of passive frequency-selective circuits, including Low-Pass, High-Pass, and Band-Pass filters.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate standard competence in calculating direct and inverse Laplace transforms, utilizing functional properties, operational rules, and partial fraction expansions. 2. Define and model standard singularity functions (step and impulse functions), and evaluate system dynamics and stability through pole-zero distributions on the s-plane. 3. Transform passive circuit elements (R, L, C) with initial conditions into their s-domain equivalents to derive transient and steady-state time-domain solutions.

	4. Derive system Transfer Functions H(s) and apply the convolution integral to evaluate time-domain outputs for arbitrary continuous inputs in linear time-invariant (LTI) systems. 5. Analyze frequency-selective circuits and evaluate the magnitude and phase response of fundamental passive filters (Low-Pass, High-Pass, and Band-Pass filters).
Indicative Contents المحتويات الإرشادية	The indicative content includes the following topics: 1. Introduction to Laplace transform: -Overview of the Laplace transform, definition of the integral transform, and transition from time-domain differential equations to s-domain algebraic equations. 2. Definition of step and impulse functions: -Mathematical definitions, graphical plots, and properties of the unit step function u(t). 3. Applying the Laplace transform and Laplace inverse: -Step-by-step procedures for solving differential equations using direct Laplace transformation and finding original time-domain functions via inverse transformations. 4. The use of Laplace transform in circuit analysis and applications: -Converting resistors, inductors, and capacitors into s-domain models with initial conditions, and setting up mesh/nodal equations for circuits. 5. Transfer function: Definition of the system transfer function H(s) as the ratio of output to input transforms under zero initial conditions, and zero-state response evaluation. 6. Convolution integral: The mathematical formulation of the time-domain convolution integral and its use in evaluating LTI system responses to arbitrary input. 7. Steady-state sinusoidal response: Determining the steady-state response of linear circuits to sinusoidal inputs using frequency-domain phasor concepts and network function. 8. The impulse function in circuit analysis: Analyzing the transient behavior and zero-input response of electrical networks subjected to impulse function excitations. 9. Introduction to frequency selective circuits (Low-pass, High-pass, and Band-pass filters): Principles of passive filters, cutoff frequencies, magnitude and

	phase characteristics, and transfer function analysis of Low-Pass, High-Pass, and Band-Pass filters.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
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, 10	LO #1, 2, 3, 4, 5 and 6.
	Assignments	2	20% (10)	2, 12	LO # 3 ,8 and 9
	Projects / Lab.				
	Report	1	10%(10)	13	LO # 5, 7 and 10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to La 'place transform.
Week 2	Definition of step and impulse functions.
Week 3	Functional and operational La' place transforms.
Week 4	Applying the La 'place transform and La' place inverse.
Week 5	Poles & zeros of F(s).
Week 6	The use of La place transform in circuit analysis and applications.
Week 7	Mid-term Exam
Week 8	Transfer function.
Week 9	Partial function expansions.
Week 10	Convolution integral.
Week 11	Steady-state sinusoidal response.
Week 12	The impulse function in circuit analysis.
Week 13	Introduction to frequency selective circuits (Low pass filter).
Week 14	Introduction to frequency selective circuits (high pass filter).
Week 15	Introduction to frequency selective circuits (band pass filter).

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Charles K. Alexander, Matthew N.O. Sadiku. ,Fundamentals of Electric Circuits, 4th Edition,	No
Recommended Texts	ELECTRIC CIRCUITS by James W. Nilsson and Susan A. Riedel TENTH EDITION	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electromagnetic Fields II**			**Module Delivery**	
Module Type	**Core**			☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ECE224**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**2**	**Semester of Delivery**		**4**
Administering Department		**Type Dept. Code**	**College**	**Collage of Engineering**	
Module Leader	**Fahad Ahmed Al-Amyal**		**e-mail**		
Module Leader's Acad. Title		**Lecturer**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor	**Name (if available)**		**e-mail**	**fahad.alamyal@qu.edu.iq**	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		**01/06/2025**	**Version Number**		**1.0**

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**ENG215 – Electromagnetic Fields I**	**Semester**	**3**
Co-requisites module	**ENG211 - Engineering Mathematics III**	**Semester**	**3**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**The main aims of this module are to:** **1. Analyze electric current mechanisms, current density, continuity equations, and boundary conditions for conductors and dielectric materials.** **2. Formulate concepts of polarization, relative permittivity, and electric susceptibility in linear dielectrics.** **3. Derive capacitance equations for single/multi-dielectric configurations, two-wire lines, and coaxial systems, along with stored electrostatic energy.** **4. Examine steady magnetic fields using the Biot-Savart Law and Ampere's Circuital Law for diverse current structures.** **5. Introduce the Curl operator, Stokes' Theorem, magnetic flux density ($\bar{B}$), Maxwell's magnetostatic equations, magnetic materials, and inductance.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Upon successful completion of this module, students will be able to:** • **LO1: Apply current density and the continuity equation to electric charge conservation and conductor/dielectric boundaries.** • **LO2: Evaluate polarization, electric susceptibility, and boundary conditions across different dielectric interfaces.** • **LO3: Calculate capacitance and stored energy for parallel-plate, coaxial, spherical, and two-wire line configurations.** • **LO4: Compute magnetic field intensity ($\bar{H}$) and flux density using Biot-Savart and Ampere's Circuital Laws for line, sheet, solenoid, and toroid current sources.** • **LO5: Evaluate field curl, apply Stokes' Theorem, solve Lorentz force problems, and compute reluctance and permeability in magnetic circuits.**
Indicative Contents المحتويات الإرشادية	**This module covers conductors, dielectrics, capacitance systems, steady magnetic fields, and magnetic materials. It begins with electric current, convection and conduction current densities, charge conservation, integral and point forms of the continuity equation, and conductor boundary conditions. It then explores dielectric polarization ($\bar{P}$), electric susceptibility, relative permittivity, and dielectric-dielectric boundary conditions. Next, the course treats capacitance systems, parallel-plate, coaxial, spherical, multi-dielectric capacitors, electrostatic energy storage, and two-wire line capacitance. Furthermore, it introduces steady magnetic fields, Biot-Savart Law for filamentary, surface, and volume currents, Ampere's Circuital Law, and its applications to coaxial cables, infinite current sheets, solenoids, and toroids. Finally, it examines the Curl operator (curl H = J), point form of Ampere's Law, Stokes' Theorem, magnetic flux density ($B = u_0 \times H$), Gauss's Law for magnetic fields (div B = 0), the Lorentz force equation $F = Q(E + v\,x\,B)$, magnetic circuits, reluctance, magnetization M, and magnetic permeability.**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**The instructional approach for this module is structured to develop strong theoretical understanding and practical problem-solving skills in electromagnetics through:** **1. Interactive Face-to-Face Lectures: Delivering core mathematical derivations, theoretical concepts, physical interpretations, and vector operations using whiteboard and multimedia slides.** **2. Problem-Solving & Tutorial Sessions: Guiding students through analytical step-by-step solutions to engineering problems involving vector calculus, charge distributions, Gauss's Law, and electric potential calculations.** **3. Self-Directed Study & Homework Assignments: Assigning weekly problem sets and practice exercises to reinforce conceptual comprehension and independent analytical thinking.** **4. Formative Assessment & Discussion: Engaging students with short conceptual questions and quick diagnostic tests to provide immediate feedback on student understanding.**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**80**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**70**	**Unstructured SWL (h/w)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	**--**
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**	**4**	**15% (15)**	**2, 5, 9, 12**	**LO #1, 2**
	Assignments	**2**	**10% (10)**	**3, 10**	**LO # 2, 3**
	Homework	**4**	**10% (10)**	**Continuous**	**All**
	Seminar	**1**	**5% (5)**	**13**	**LO # 4, and 5**
Summative assessment	**Midterm Exam**	**2 hr.**	**10% (10)**	**7**	**LO # 1-2**
	Final Exam	**2 hr.**	**50% (50)**	**16**	**All 1-5**
Total assessment			**100% (100 Marks)**		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Electric Current & Current Density: Definition of current, convection and conduction current densities, differential current element, and vector integration for total current.**
Week 2	**Continuity of Current & Charge Conservation: Principle of conservation of charge, integral and point forms of the continuity equation, and solved continuous current examples.**
Week 3	**Conductor Properties & Boundary Conditions: Conductor interior charges, tangential and normal field components at conductor surfaces, equipotential surfaces, and boundary condition examples.**
Week 4	**Dielectric Materials & Polarization: Bound charges vs free charges, polar and nonpolar molecules, dipole moment, polarization vector (P), bound volume charge density, and generalized electric flux density.**
Week 5	**Dielectric Boundary Conditions & Isotropic Media: Electric susceptibility, relative permittivity, boundary conditions at dielectric-dielectric interfaces, refraction of field lines, and illustrative problems.**
Week 6	**Capacitance & Energy Storage: Fundamental definition of capacitance, parallel-plate capacitor derivation, energy stored in capacitors, and dielectric permittivity problems.**
Week 7	**Coaxial, Spherical & Multi-Dielectric Capacitors: Capacitance of coaxial cables, spherical shells, isolated spheres, series/parallel multi-dielectric arrangements, and composite capacitor examples.**
Week 8	**Midterm Examination & Review of Conductors, Dielectrics, and Capacitance Systems.**
Week 9	**Capacitance of Transmission Lines: Two-wire transmission lines, equipotential surfaces, cylinder-to-plane capacitance, maximum/minimum surface charge density, and solved line-capacity problems.**
Week 10	**The Steady Magnetic Field & Biot-Savart Law: Sources of magnetic fields, Biot-Savart Law for differential current elements, magnetic field intensity ($\bar{H}$) for infinite and finite line conductors, and filamentary examples.**
Week 11	**Ampere's Circuital Law & Applications: Ampere's Circuital Law definition, magnetic fields of coaxial cables, surface current sheets, ideal solenoids, and toroids.**
Week 12	**The Curl Operator & Point Form of Ampere's Law: Derivation of the Curl operator (curl H = J), Curl in Cartesian, Cylindrical, and Spherical coordinates, physical meaning, and second Maxwell's equation.**

Week 13	**Stokes' Theorem & Magnetic Flux Density: Formulation and evaluation of Stokes' Theorem, magnetic flux density ($\bar{B} = u_0 \times \bar{H}$), Gauss's Law for magnetic fields (div $\bar{B}$ = 0), and fourth Maxwell's equation.**
Week 14	**Magnetic Forces, Circuits & Permeability: Lorentz force equation, magnetic circuits, magnetomotive force, reluctance, magnetization (M), magnetic susceptibility, and magnetic materials.**
Week 15	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 8th Edition, McGraw-Hill, 2012.**	Yes
Recommended Texts	**Elements of Electromagnetics, Matthew N. O. Sadiku, 7th Edition, Oxford University Press, 2018.**	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Transmission lines**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE223**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		2	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Israa Amer Dahham		**e-mail**	Esraa.daham@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** To understand the basic concepts of transmission lines. **2.** To Understanding Ability to identify, formulate, and solve engineering problems using **3.** principles of engineering, science, and mathematics.. **4.** To Ability to produce engineering designs that meet specified needs within **5.** realistic constraints. **6.** To Understanding the Ability to conduct appropriate measurements and tests, analyze results, and make sound engineering judgments. **7.** To recognize ethical and professional responsibilities in engineering situations **8.** To Understanding the fundamentals of designing and practical experience.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Ability to design and trace electronic circuits (schematic diagrams). **2.** The ability to analyze the structure of electronic devices and the operating principles of integrated circuits. **3.** Ability to use testing and measuring equipment. **4.** The ability to communicate effectively in oral and written forms.
Indicative Contents المحتويات الإرشادية	-Indicative content includes the following: -Ability to function effectively on teams and manage tasks and risks. -Ability to work in a team -Ability to recognize the importance of continuous professional development and lifelong learning. -Analyzing and implementing various applications of transmission lines. -Study of practical applications of transmission lines.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will focus on encouraging active student participation in exercises to refine and expand their critical thinking skills. The module will utilize classes, interactive tutorials, and simple experiments involving sampling activities to engage and interest students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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, 10	LO #1, 2
	Assignments	2	10% (10)	2, 12	LO # 3, 4, and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, and 5
Summative assessment	**Midterm Exam**	2 hr.	10% (10)	7	LO # 1-2
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Transmission Line Theory
Week 2	Propagation modes of the transmission lines and Wave Propagation on a Transmission Line ,quiz
Week 3	Attenuation Constants of Transmission Lines.
Week 4	Telegrapher Equations.
Week 5	Lossless transmission line, characteristic impedance .
Week 6	Standing Waves, Voltage Standing Wave Ratio (VSWR).

Week 7	Maximum and minimum impedance ,short and open cct.
Week 8	Mid-term Exam.
Week 9	Voltage Reflection Coefficient.
Week 10	Input impedance of a lossless transmission line, Matched transmission line(stub matching).
Week 11	Application of short-circuit and open-circuit measurements.
Week 12	Power flow on a lossless transmission line.
Week 13	Smith Chart. VSWR, Voltage Maxima and Voltage Minima on the smith charge.
Week 14	Input impedance, Impedance Matching on the smith chart.
Week 15	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Transmitter design. Andrei,2011,	Yes
Recommended Texts	Microwave engineering ,second edition ,wiley.	No
Websites	https://www.analoge devices courses and tutorials.	

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	**Electronics II**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☒**Seminar**	
Module Code	**ECE225**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		2	**Semester of Delivery**		4
Administering Department		ECE	**College**	Type College Code	
Module Leader	Wurood Idrees Shatnan		**e-mail**	Worod.adris@qu.edu.iq	
Module Leader's Acad. Title		Assistant Lecture	**Module Leader's Qualification**		Master
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Electronics I	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop problem solving skills and understanding of transistors electronic circuits theory through the application of techniques. 2. To understand basic principles, operation, and characteristics of BJT transistor, models, and behavior in the different configurations. 3. This course deals with the dc and ac analysis of the BJT transistor circuits 4. To understand the different types of power amplifiers built around the BJT transistor.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the different configurations or transistor connections. 2. Recognizing the biasing methods of transistor. 3. Demonstrating the three basic modes of amplifier circuits CE, CC, and CB. 4. Understanding the operation of transistor amplifiers equivalent circuit. 5. Understanding the operation and drawbacks of the class A amplifier. 6. Understanding the operation and drawbacks of the class B amplifier. 7. Understanding the operation and drawbacks of the class AB amplifier. 8. Understanding the operation and drawbacks of the class C amplifier.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: BJT transistor modelling, the transistor Model. Common –emitter fixed-bias configuration , CE-emitter –bias configuration, Voltage-divider bias. Emitter-follower configuration, common-base configuration, and collector feedback configuration. Effect of RL and Rs, determining the current gain. Cascade systems, Darlington connection. The hybrid equivalent model and approximate hybrid equivalent model. BJT frequency response, low -frequency response of BJT. High frequency response of BJT, multistage frequency effects, and square- wave testing. Power amplifiers, series-fed class A amplifier, and transformer –coupled class A amplifier. Class B amplifier operation, class B amplifier circuit, and amplifier distortion. Revision problem classes Feedback amplifiers, feedback connection types, voltage-series feedback. Voltage-shunt feedback, current-series feedback, current- shunt feedback.

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 deep learning of this subject and solving the relative 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 and encourage them to more thinking and competition.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	120	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	80	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 5, 7 and 8
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 6
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	BJT transistor modelling, the re transistor Model.
Week 2	Common –emitter fixed-bias configuration, CE-emitter –bias configuration.
Week 3	Voltage-divider bias.
Week 4	Emitter-follower configuration, common-base configuration, collector feedback configuration.
Week 5	Effect of RL and Rs, determining the current gain.
Week 6	Cascade systems, Darlington connection
Week 7	The hybrid equivalent model, approximate hybrid equivalent model.
Week 8	Mid-term Exam

Week 9	BJT frequency response, low -frequency response of BJT.
Week 10	High frequency response of BJT, multistage frequency effects, square- wave testing.
Week 11	Power amplifiers, series-fed class A amplifier, transformer –coupled class A amplifier.
Week 12	Class B amplifier operation, class B amplifier circuit, amplifier distortion.
Week 13	Collector Feedback Configuration, Emitter¬ Follower Configuration, Common-Base Configuration.
Week 14	Feedback amplifiers, feedback connection types, voltage-series feedback. Voltage-shunt feedback, current-series feedback, current- shunt feedback.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1,2	Lab 1: Review & Introduction to Lab. CE amplifier.
Week 3,4	Lab 2: CC amplifier.
Week 5,6	Lab 3: CB amplifier.
Week 7	**Practical Exam**
Week 8,9	Lab 4: Transistor as a switch.
Week10,11	Lab 5: class A amplifier.
Week 12,13	Lab 6: Class AB amplifier.
Week 14,15	Lab 7: Class C amplifiers

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Electronics Fundamentals. Circuits, Devices, and Applications, Thomas L. Floyd David L. Buchla. Eighth Edition	Yes
Recommended Texts	Electronic Devices, Conventional current version. Thomas L. Floyd David.	Yes

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer 2**			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**QU24**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		2	**Semester of Delivery**		4
Administering Department		**ECE**	**College**	ENG-QU	
Module Leader	MS.C. Safaa Abbood Kadhim		**e-mail**	safaa.abbood@qu.edu.iq	
Module Leader's Acad. Title		Assistant lecturer	**Module Leader's Qualification**		M.Sc.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to equip students with fundamental computer skills and knowledge, providing them with a comprehensive understanding of computer hardware, software, and basic computing operations. The course will: 1. Enable students to use computers for essential tasks and operations. 2. Familiarize students with computer hardware components and their functions. 3. Teach students how to create and format documents using word processing software, as well as how to develop presentations. 4. Guide students in conducting effective research using the Internet and related tools. 5. Introduce students to the concepts and applications of Artificial Intelligence (AI) and its relevance in everyday life.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Utilize the computer for fundamental tasks such as creating and managing documents, presentations, and basic data processing. 2. Identify and explain the functions of various computer hardware components, including input/output devices, memory, and CPU. 3. Create, format, and manipulate text documents using word processing software, including tasks like spell-check, table handling, and document printing. 4. Create and manage spreadsheets, perform basic calculations, and utilize formulas and functions for data manipulation. 5. Design and deliver presentations using presentation software, manage slide shows, and prepare handouts. 6. Conduct research on the Internet, using search engines and web browsers efficiently to find relevant information. 7. Understand basic networking concepts and demonstrate the ability to connect and configure devices. 8. Send and manage emails effectively, including the use of email attachments and document collaboration tools. 9. Troubleshoot common hardware and software issues, applying basic problem-solving techniques to resolve typical computer-related problems. 10. Demonstrate an understanding of Artificial Intelligence (AI), its history, applications, and ethical considerations.

Indicative Contents المحتويات الإرشادية	1-Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting (2 hr Theoretical ,2 hr Practical) 2-E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking(2 hr Theoretical ,2 hr Practical) 3-Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.(4 hr Theoretical, 4 hr Practical) 4-Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.(4 hr Theoretical ,4 hr Practical) 5-Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant.)(4 hr Theoretical and 4 hr Practical) 6-Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising. (6 hr Theoretical and 6 hr Practical) 7-Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity.)(2 hr Theoretical and 2 hr Practical) 8-Ethical Challenges in Al: (Al ethics, privacy and surveillance, the impact of Al on the job market.) (2 hr Theoretical and 2 hr Practical) 9-The Future of Al (Future trends in Al, recent research and emerging technologies.) (2 hr Theoretical and 2 hr Practical)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course will use the following teaching and learning methods • Board (Normal or Smart) • Computers • Presentation software such as PowerPoint

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	55	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Number	**Marks**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2 and 3
	Online Assignments (واجبات بيتية)	1	10% (10)	2, 12	LO #1, 2 and 3
	Assignments Onsite (واجبات صفية)	1	10% (10)	4, 11	LO # 5, 8 and 10
	Report	1	10% (10)	13	LO #1, 2 and 3
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting.
Week 2	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking.
Week 3	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 5	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 6	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 7	Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant.
Week 8	Mid-term Exam
Week 9	Applications of Al: Education, Healthcare.
Week 10	Applications of Al: Finance, Transportation.
Week 11	Applications of Al:Marketing and Advertising.
Week 12	Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity).
Week 13	Ethical Challenges in Al: (Al ethics, privacy and surveillance, the impact of Al on the job market).
Week 14	The Future of Al (Future trends in Al, recent research and emerging technologies).
Week 15	final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Security and Networking: What is a network? Types of networks. Basic network components. Network Security Basics. Understanding network threats. Network Troubleshooting
Week 2	E-Commerce: Concepts of Electronic banking services this include online banking: ATM and debit card services, Phone banking, SMS banking, electronic alert, Mobile banking
Week 3	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter. Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 5	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 6	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Challenges and Ethical Considerations.
Week 8	Al in Our Daily Lives: Al in smartphones and virtual assistants like Siri or Google Assistant.
Week 9	Mid-term Exam
Week 10	Applications of Al: Education, Healthcare, Finance, Transportation, Marketing and Advertising.
Week11	Al and Society: (How Al affects social, Al and international relations, Al and the future of humanity.)
Week 12	Ethical Challenges in Al: (Al ethics, privacy and surveillance, the impact of Al on the job market.)
Week 13	The Future of Al (Future trends in Al, recent research and emerging technologies.)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd Edition (2020)	No
Recommended Texts	1. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology In Action Complete,"16th Edition.2020 2. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition. 2020	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	**English Language 2**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**QU21**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		2	**Semester of Delivery**		4
Administering Department		ECE	**College**	Type College Code	
Module Leader	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**		
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**	hayder.hamzah@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		10/10/2026	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The primary aim of this module is to move students from elementary to pre-intermediate competence in English, enabling them to communicate effectively in familiar contexts. It seeks to: Consolidate and extend students' knowledge of core grammar structures (tenses, conditionals, passives). Develop vocabulary in key lexical sets related to daily life, work, travel, and social situations. Improve the four language skills (listening, speaking, reading, writing) through integrated tasks that balance fluency and accuracy. Equip students with functional language for real-world interactions, such as making requests, giving directions, and social expressions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Grammar: Demonstrate control of pre-intermediate structures (e.g., Present Perfect vs. Past Simple, *used to*, Passives, First/Second Conditionals) in both controlled and freer practice. 2. Vocabulary: Use an expanded range of vocabulary to discuss topics such as personality, daily routines, future plans, and shopping. 3. Listening: Listen to and extract specific information from straightforward conversations and monologues on familiar topics. 4. Reading: Understand the main points and specific details in short narrative and informative texts. 5. Speaking: Initiate and sustain simple face-to-face conversations, express opinions, and describe experiences and plans with reasonable fluency. 6. Writing: Construct connected text (e.g., informal emails, short narratives, postcards) using appropriate linking words and grammatical structures.
Indicative Contents المحتويات الإرشادية	1. Tenses revision (Present/Past); Questions; Using a dictionary; Social expressions; Present Simple vs. Continuous; *have/have got.* 2. Past Simple vs. Past Continuous; Quantity (*much/many*, *some/any*); Articles; Shopping and prices. 3. Future forms (*going to, will*); Verb patterns; *What...like?*; Comparatives/Superlatives; Directions. 4. Present Perfect (*for/since*); *have to, should, must*; Adverbs; Health and the body. 5. Time clauses (*if/when*); Verb patterns (*manage to, used to*); *-ed/-ing* adjectives; Hotels. 6. Passives; Verbs + nouns; Second Conditional; *might*; Phrasal verbs; Social expressions (2). 7. Present Perfect Continuous; Word formation; Telephoning; Past Perfect; Reported statements.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Integrated Skills Approach: Every unit integrates reading/listening with speaking/writing tasks to contextualize new language. 2. Grammar in Context: Structures are introduced through texts and dialogues, encouraging students to discover rules before practicing them. 3. Communicative Activities: Emphasis on role-plays, pair work, and group discussions (e.g., "Everyday English" sections) to build confidence. 4. Vocabulary Strategies: Focus on lexical sets, sound/spelling relationships, and dictionary skills. 5. Personalization: Tasks encourage students to relate topics (e.g., daily routines, future plans) to their own lives.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10	Weeks 5, 11	MLO1, MLO2
	Assignments	4	20	Weeks 3, 7, 10, 14	MLO5, MLO6
	Projects / Lab.	N/A	N/A	N/A	N/A
	Report	1	10	Week 12	MLO6
Summative assessment	**Midterm Exam**	1	10	Week 8	MLO1 – MLO4
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Revision of core tenses; Classroom language
Week 2	Describing daily life; Making conversation
Week 3	Telling stories about the past
Week 4	Talking about food & prices; Polite requests
Week 5	Discussing plans and feelings
Week 6	Describing places & people; Asking for directions
Week 7	Talking about experiences & duration
Week 8	Obligation, advice, and at the doctor's
Week 9	Making arrangements and conditions
Week 10	Talking about past habits and feelings
Week 11	Describing processes and notices
Week 12	Hypothetical situations and social expressions
Week 13	Discussing ongoing activities; Phone skills
Week 14	Reporting what others said; Course wrap-up
Week 15	Consolidation and assessment

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	New Headway Pre-Intermediate Level	Yes
Recommended Texts		
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	**Sustainability and Energy Conversion I**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE311				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3	**Semester of Delivery**		5
Administering Department		ECE	**College**	ENG-QU	
Module Leader	Faris Asaad Abdulmunem		**e-mail**	faris.a.abdulmunem@qu.edu.iq	
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		01/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understand the concept of energy conversion and its significance in various industries. 2. Understand the concept of magnetic circuit and their relevance to electronics and communication engineering. 3. Explain Flux density, magnetic materials, and Inductance as a parameters of energy conversion in magnetic circuits. 4. Study the transformer principle as an example of energy conversion system. 5. Explain the DC and AC Machine types and operations. 6. Comprehend the working principles and construction of servo & stepper motors. 7. Understand the applications of servo and stepper motors.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. An ability to conduct the main concepts of energy conversion. 2. Explain the operating principles of transformers, including electromagnetic induction and the relationship between primary and secondary voltages and turns. 3. Analyze and compare the characteristics, advantages, and limitations of DC machines. 4. Classify and describe AC machines, including synchronous and induction machines, and identify their fundamental operating principles. 5. Explain the working principles and applications of servo motors in control systems and automation. 6. Evaluate the capabilities and limitations of stepper motors for precise motion control applications.
Indicative Contents المحتويات الإرشادية	1) Magnetic Circuits: Basic concepts of magnetic circuits, magnetic flux, Magnetic Flux Density, magnetomotive force (MMF), magnetic reluctance. and their applications in electrical and electronic devices. 2) Inductance and Energy Storage: Factors affecting inductance, self-inductance, mutual inductance, and energy stored in a magnetic field. 3) Transformer Principles: Basic operating principles of transformers, electromagnetic induction, turns ratio, and voltage transformation. 4) DC Machine Types: Classification of DC machines, including DC generators

	and DC motors, and their main configurations. 5) DC Machine Operation: Operating principles of DC generators and motors, electromagnetic energy conversion, and basic characteristics and applications. 6).AC Machine Types: Classification of AC machines, including synchronous machines and induction machines, and their basic characteristics. 7).AC Machine Operation: Fundamental operating principles of AC machines, electromagnetic energy conversion, and practical applications. 8) Stepper Motors: Construction, main types, and characteristics of stepper motors, with emphasis on precise motion control. 9). Stepper Motor Operation and Applications: Step-by-step operation, excitation and control methods, and applications in positioning systems, instrumentation, and automation. 10).Servo Motor Principles: Basic concepts of servo systems, feedback control, position control, and speed control. 11).Servo Motor Operation and Applications: Operating characteristics of servo motors and their applications in automation, robotics, and control systems.

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

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	80	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Magnetic circuit.
Week 2	Flux density, magnetic materials.
Week 3	Inductance: factor effects inductance, energy stored.
Week 4	Transformer principles.
Week 5	DC Machine types.
Week 6	DC Machines operation.
Week 7	Mid-term Exam.
Week 8	AC Machine Types.
Week 9	AC Machines Operation.
Week 10	Special Machines stepper motor.
Week 11	Servo motor principles.
Week 12	Servo motor operation and applications.
Week 13	Stepper motor.
Week 14	Stepper motor operation and applications.
Week 15	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Introductory Circuit Analysis, Robert L. Boylestad , Eleventh Edition, Pearson Prentice Hall, 2007	Yes

Recommended Texts	Electrical and Electronic Principles and Technology, JOHN BIRD, Second edition, Newnes , 2003	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	**Communication systems I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE312**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		3	**Semester of Delivery**		5
Administering Department		ECE	**College**	Type College Code	
Module Leader	Ahmed Adil Hashem		**e-mail**	Ahmed.albosham@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name		Ahmed Adil Hashem	**e-mail**	Ahmed.albosham@qu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** Students will demonstrate the ability to model and analyze signals and systems. **2.** Students will understand the concept of modulation and demodulation techniques. **3.** Students will demonstrate the ability to design a communication system based on the requirements (BW, complexity, capacity, ...etc.) **4.** Identify multiplexing techniques for channel sharing and hence multiuser occupation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the semester, the student will be able to: **1.** Classify signals according to their properties (deterministic and random, periodic and aperiodic, phasor and spectra) by using mathematical tools such as energy/power calculations, Fourier series and Fourier transform to represent signal in time/frequency domains and find signal spectrum. **2.** Classify systems in terms of LTI and distortion type: linear distortion, nonlinear distortion, as well as ideal filters, practical filters. **3.** Design principally a modulation & demodulation system for CW waves based on the requirements using AM, FM, and PM. **4.** How to use a suitable multiplexing technique (TDM, or FDM) for multiuser occupations and BW reduction purposes.
Indicative Contents المحتويات الإرشادية	**Indicative Contents:** Introduction to communication systems; signals and linear systems; Fourier series and Fourier transform; energy and power spectral density; amplitude modulation (AM), DSB-SC, SSB and VSB; amplitude modulation generation and detection; frequency and phase modulation (FM/PM), bandwidth and Carson's rule; noise in communication systems and signal-to-noise ratio; analog communication receivers and superheterodyne receivers; sampling theorem and aliasing; pulse modulation; multiplexing techniques; and performance analysis of analog communication systems, with practical applications and MATLAB/Simulink simulations.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Interactive lectures, problem-solving activities, and practical demonstrations are used to develop students' understanding of communication systems. Students engage in MATLAB/Simulink simulations and laboratory experiments related to modulation, Fourier analysis, sampling, and noise. Group activities, discussions, and real-world applications are used to develop analytical and problem-solving skills, supported by continuous assessment and feedback.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	١١٠	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٧,٣
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٤٠	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٢,٦
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٥٠		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Signals and Systems: 1. Signal models :Deterministic and random signals; Periodic and aperiodic signals; Phasor signals and spectra; Singularity functions 2. Energy Signals and Power Signals ،Electrical power and energy; Energy signals and power signals.
Week 2	Fourier Series: Complex exponential Fourier series; Symmetry properties; Trigonometric forms of the Fourier series; Parseval's power theorem; Fourier series table; Line spectra

Week 3	Fourier Transform: Fourier transforms; Symmetry Properties; Convolution; Transform Theorem.
Week 4	Fourier transform pairs; Fourier transforms of periodic Signals.
Week 5	Spectral Density and Correlation Functions Rayleigh's energy theorem; Correlation functions of energy signals; Power spectral density
Week 6	Correlation functions of power signals; Autocorrelation of power signals
Week 7	Mid-term Exam
Week 8	LTI systems; Linear distortion; Nonlinear distortion; Ideal filters; Practical filters
Week 9	Continuous-Wave Modulation Systems: Amplitude Modulation DSB modulation; Conventional AM
Week 10	SSB modulation; Hilbert Transform; The superheterodyne receiver; Interference; Noise
Week 11	Angle Modulation: Phase and frequency modulation; Narrowband angle modulation
Week 12	Spectrum of an angle-modulated signals; Carson's rule.
Week 13	Direct FM generation; Indirect FM generation; Demodulation
Week 14	Multiplexing Techniques: Frequency division multiplexing; Frequency division multiplexing; Stereophonic
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Double Sideband AM Generation (DSB) and Double Sideband AM Reception
Week 2	Lab 2: Single Sideband AM Generation (SSB) and Single Sideband AM Reception
Week 3	Lab 3: Frequency Modulation using Varactor
Week 4	Lab 4: Frequency Modulation Using Reactance Modulator
Week 5	Lab 5: Operation of Detuned Resonant Circuit
Week 6	Lab 6: Operation of Phase-Locked Loop Detector
Week 7	Lab 7: Operation of VCO Modulator and PLL Detector

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Modern digital and analog communication systems. 2. Communication systems.	Yes
Recommended Texts	Communication Systems Engineering. 2. Analog and Digital Signals and Systems. 3. An Introduction to Analog and Digital Communications.	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	**Electronics III**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE313				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	3		**Semester of Delivery**	5	
Administering Department	ECE		**College**	ENG-QU	
Module Leader	Iyad Hamid Abid		**e-mail**	iyad.alumari@qu.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Iyad Hamid Abid		**e-mail**	iyad.alumari@qu.edu.iq	
Peer Reviewer Name	Dr. Musa H. Wali		**e-mail**	musa.h.wali@qu.edu.iq	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Electronics I, Electronics II	**Semester**	3,4
Co-requisites module	Electric circuit I , Electric circuit II	**Semester**	1, 2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Module Aims The aim of this module is to provide students with a comprehensive understanding of field-effect transistors (FETs), including JFETs and MOSFETs, their characteristics, biasing techniques, and amplifier configurations. The module also covers the principles and applications of operational amplifiers in linear and nonlinear circuits, including inverting and non-inverting amplifiers, summing amplifiers, difference amplifiers, differentiators, integrators, voltage comparators, and Schmitt triggers. Furthermore, students will study oscillator circuits, their types and applications, multivibrators, and the practical applications of the IC 555 timer.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. On successful completion of this course, students will be able to: 2. Analyze the characteristics and operation of FET devices, including JFETs and MOSFETs. 3. Analyze and design DC biasing circuits for field-effect transistors. 4. Analyze and design FET amplifier circuits using common-source, common-drain, and common-gate configurations. 5. Analyze and design operational amplifier circuits for linear and nonlinear applications. 6. Design and analyze oscillator circuits, multivibrators, and IC 555 timer applications. 7. Construct and test electronic circuits and perform electrical measurements using appropriate laboratory instruments. 8. Interpret experimental results and compare practical measurements with theoretical calculations.
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following:** 1. The indicative contents of Electronic III include the following topics:

	2. **Field-Effect Transistors (FETs):** JFET and MOSFET types, construction, operating principles, characteristics, parameters, and ratings. 3. **DC Biasing Analysis and Design:** Fixed-bias circuits, self-bias circuits, voltage-divider bias, MOSFET biasing techniques, and DC operating-point determination. 4. **FET AC Analysis:** Small-signal models, voltage gain, input and output resistance, common-source, common-drain, and common-gate amplifiers, single-stage and cascaded amplifiers. 5. **Operational Amplifiers:** Ideal and practical characteristics, inverting and non-inverting amplifiers, summing amplifiers, difference amplifiers, differentiators, integrators, and voltage comparators. 6. **Nonlinear Op-Amp Applications:** Schmitt triggers and waveform-shaping circuits. 7. **Oscillators:** Principles of oscillation, feedback requirements, and common oscillator types. 8. **Multivibrators:** Astable, monostable, and bistable circuits and their applications. 9. **IC 555 Timer:** Operating principles and applications in timing, pulse generation, and oscillator circuits
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Here are the strategies that can be employed in teaching Electronic III to third-year students:** 1. 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	125	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	50	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Construction and characteristics of JFETs; transfer characteristics and important relationships
Week 2	Depletion-mode and enhancement-mode MOSFETs: construction, operation, and characteristics.
Week 3	JFET DC biasing circuits: fixed-bias, self-bias, and voltage-divider bias configurations.
Week 4	Common-gate configuration; depletion-mode and enhancement-mode MOSFET biasing; combined biasing networks.

Week 5	JFET small-signal model; AC analysis of fixed-bias, self-bias, and voltage-divider bias configuration
Week 6	Common-gate and common-drain amplifier configurations; AC analysis of depletion-mode and enhancement-mode MOSFETs.
Week 7	Enhancement-mode MOSFET drain-feedback biasing; FET amplifier design; cascaded amplifier configurations.
Week 8	Mid-term Exam
Week 9	FET frequency response: low-frequency and high-frequency response; frequency effects in multistage amplifiers.
Week 10	Fundamentals of operational amplifiers; practical op-amp circuits and linear applications.
Week 11	Operational amplifier specifications, including DC offset and frequency parameters; voltage comparators and nonlinear applications.
Week 12	Inverting and non-inverting amplifiers; summing and difference amplifiers; differentiators, integrators, voltage comparators, and Schmitt triggers.
Week 13	Oscillator principles and operation; Wien-bridge, tuned-circuit, crystal, and phase-shift oscillators
Week 14	Multivibrators and IC 555 timer applications: astable, monostable, and bistable circuits.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1,2	Lab 1:Field Effect transistor measure and graph the drain characteristic curves for a junction field-effect transistor(JFET).
Week 3,4	Lab 2: Biasing of JFET
Week 5,6	Lab 3: Common Source Common Gate and Common Drain Amplifiers .E-MOSFET Characteristics
Week 7	**Practical Exam**
Week 8,9	Lab 4: The Differential amplifier and Op-Amp Characteristics
Week10,11	Lab 5: linear Op-Amp Circuit inverting and non-inverting amplifiers using op-amp .

Week 12,13	Lab 6: Comparator Circuit / Level Detection
Week 14	Lab 7: Op-amp Summing Circuit / ADC
Week 15	exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Electric circuits fundamentals by Floyd, Thomas L	yes
Recommended Texts	1. ELECTRONICS DEVICES AND CIRCUIT THEORY by R. BOYLESTED. 2. Microelectronic Circuits by Sedra	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	**Antennas**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE314**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		3	**Semester of Delivery**		5
Administering Department		ECE	**College**	Type College Code	
Module Leader	Kawthar Jabbar Mezher		**e-mail**	Kawther.alfatlawi@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name		Kawthar Jabbar Mezher	**e-mail**	Kawther.alfatlawi@qu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	Electromagnetic fields I and II	**Semester**	3 and 4

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To provide students with a comprehensive understanding of fundamental antenna concepts and parameters. 2. To introduce students to various types of antennas and their design principles. 3. To develop students' skills in analyzing and evaluating antenna radiation patterns, directivity, and gain. 4. To familiarize students with different antenna arrays and their characteristics. 5. To explore microwave antennas and their applications in communication systems. 6. To introduce students to broadband and frequency-independent antennas.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students should be able to: 1. Explain the fundamental antenna concepts, including antenna parameters, radiation patterns, beamwidth, and directivity. 2. Analyze and interpret antenna radiation patterns, directivity, and gain. 3. Design and evaluate simple dipole and monopole antennas. 4. Understand the principles and characteristics of different types of antennas, such as loop antennas, Yagi antennas, and helical antennas. 5. Analyze and design antenna arrays, including broadside arrays, endfire arrays, and scanning arrays. 6. Describe the properties and applications of microwave antennas, such as horn antennas, reflector antennas, slot antennas, and lens antennas. 7. Understand the principles and design considerations of folded dipole antennas. 8. Evaluate the characteristics and advantages of broadband and frequency-independent antennas.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Introduction to Communication Systems and Antenna Design. Introduction to antennas and radiation mechanisms; antenna parameters and characteristics; radiation from short dipoles and linear antennas; half-wave dipole and monopole antennas; antenna arrays and array factors; loop antennas; aperture and horn antennas; reflector antennas; microstrip patch antennas; helical, Yagi-Uda, and traveling-wave antennas; antenna measurements; polarization, gain, directivity, beamwidth, and impedance.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary strategy for presenting this module is to encourage student participation, improve critical thinking abilities, and provide opportunities for hands-on learning. Students will be actively engaged in the learning process and provided with vital skills for their academic and personal improvement by incorporating classes, interactive tutorials, and easy experiments.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	55	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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, 10	LO #1, 2
	Assignments	2	10% (10)	2, 12	LO # 3, 4, and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, and 5
Summative assessment	**Midterm Exam**	2 hr.	10% (10)	7	LO # 1-2
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Communication Systems and Antenna Design
Week 2	Fundamental Antenna Concepts: Antenna Parameters, Radiation Pattern, Beamwidth, Radiation Intensity
Week 3	Directivity and Gain, Slot Concept, Effective Height, Wave Polarization, Cross-Sectional Area, Reciprocity Theorem, Image Theory, Field Regions.
Week 4	Ideal Dipole: E and H Fields, Radiation Resistance, Natural and Power Patterns, Effective Length.
Week 5	Ideal Antenna Properties: (Point Radiation Source), E and H Fields, Radiation Resistance, Standard Pattern and Power Pattern, Effective Length.
Week 6	Short Dipole: E and H Fields, Natural E-Field, Natural Power Pattern, Radiation Resistance, Thin Linear Dipole: Current Distribution, E and H Fields, Radiation Resistance.
Week 7	Mid-term Exam
Week 8	Monopole and Single Pole Antennas: Radiation Pattern, Radiation Resistance, Directivity, and Gain.
Week 9	Small Loop Antenna: E and H Fields, Radiation Resistance, Folded Dipole, Yagi Antenna, Helical Antenna.
Week 10	Point Source Array: Multiple Characteristics Point Sources, Non-interfering Point Sources, Pattern Multiplication Principle.
Week 11	Array of Dipole Pairs: Pattern Addition Principle, Broadside Array, Endfire Array, Scanning Array.
Week 12	Microwave Antennas: Horn Antenna, Reflector Antenna, Slot Antenna, Lens Antenna.
Week 13	Microwave Antennas: Dielectric Lens Antenna.
Week 14	Folded Dipole Antenna.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Antenna Theory: Analysis and Design by Constantine A. Balanis	Yes
Recommended Texts	Antennas and Wave Propagation by John D Kraus.	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	**Computer Architecture**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE315**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		3	**Semester of Delivery**		5
Administering Department		ECE	**College**	Type College Code	
Module Leader	Nora Ahmed Mohammed		**e-mail**	nora.mohammed@qu.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Master
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	To introduce and covering the fundamental principles of computer Architecture. 1. Understand the computer function and interconnection 2. Types of buses in the computer 3. The memory system, types, and the functions of each type 4. Cache memory and design modules 5. Control and logic Unit operations 6. Organizing the control memory and the order execution sequence 7. Understand the work of microprocessor in computers. 8. Types of microprocessors. 9. Understand the types of register, and the functions of each type 10. Understand the address of memory and I/O. 11. Understand minimum and maximum modes, Timing Diagram.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will demonstrate the interconnection of computer parts. 2. Students will understand the memory processes and the different between the type of memory. 3. Students will demonstrate the connection between CPU, Memory, hard disk. 4. Students will demonstrate the ability to recognize the work of control unit and organization of control memory and microinstruction execution. 5. Recognizing the principles of computer architecture. 6. Demonstration the various of memory. 7. Studying the various of register transfer. 8. Recognizing the basic computer organization. 9. Recognizing the pipelining, microprogrammed control.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Basic of Digital Computer , Parts of computer 2- Bus interconnection, PCI bus , Element of bus, PCI commands 3- Computer memory system, RAM, ROM, SRAM, DRAM, Cache memory 4- Register Transfer, Basic computer organization, Addressing Mode , Computer Instructions 5- Pipelining, control unit operation, Microprogrammed organization control

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining

	and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	55	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	A view of computer Function and Interconnection
Week 2	Bus Interconnection. Elements Of Bus Design.
Week 3	PCI Bus Structure, PCI Commands, PCI Express
Week 4	Computer Memory System: Internal Memory. SRAM, DRAM & ROM,

Week 5	Memory Interfacing, Advance DRAM Organization.
Week 6	Memory Interfacing, Advance DRAM Organization.
Week 7	Mid Exam
Week 8	Cache Memory Principles And Elements Of Cache Design
Week 9	Computer Memory System: External Memory. Hard Disk, Optical Disks,
Week 10	Segment Registers and memory segmentation, general purpose registers, status register
Week 11	Computer Arithmetic: Integer Representations And Arithmetic, Addition And Subtraction. Division And Multiplication
Week 12	Computer Arithmetic: Floating Point Representation. Floating-Point Arithmetic.
Week 13	Control Unit Operation, The Instruction Cycle, Control Unit Logic (Hardwired Implementation.)
Week 14	Microprogrammed Control: Organization Of Control Memory. Microinstruction Sequencing.
Week 15	Microprogrammed Control: Microinstruction Execution.
	Final Exam

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Computer-Organization-and-Architecture-9th-edition/ William Stalling	Yes
Recommended Texts		
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.

COURSE DESCRIPTION

COURSE INFORMATION					
Course title	**Optical Communications**			Course Delivery	
Course Type	**Core**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** **Seminar**	
Course Code	**ECE 316**				
ECTS Credits	**4**				
Total Student Workload (hours/semester)	**100**				
Course Level	3		Semester	5	
Department Code	ECE		College		
Course Instructor	Mezher Hamed Mezher		Email		
Academic Title	Assistant Professor		Instructor Qualification	Ph.D.	
Course Tutor	None		Email	Mezher.electronic@qu.edu.iq	
Reviewer			Email		
Scientific Committee Approval Date	01/06/2025		Version	1.0	

RELATIONSHIP WITH OTHER COURSES			
Required prerequisite	ECE215 – Electromagnetic Fields (Semester 2)	Semester	2
Corequisite	ENG211 – Mathematics (Semester 3)	Semester	3

COURSE AIMS, LEARNING OUTCOMES, AND INDICATIVE CONTENT	
Course Aims	This course aims to:\n• Understand optical-fiber technologies and develop the ability to design and operate optical communication systems.\n• Develop innovative solutions to data-transmission problems in optical fibers.\n• Understand how to secure optical communications and prevent intrusions.\n• Acquire practical skills in installing and maintaining optical-fiber networks.
Course Learning Outcomes	Upon successful completion of this course, students will be able to:\nLO1 – Design and implement optical-fiber networks effectively.\nLO2 – Install and maintain optical communication equipment.\nLO3 – Diagnose and troubleshoot optical-network problems.\nLO4 – Use measurement and evaluation tools to verify optical-network performance.
Indicative Course Content	Concept and importance of optical communications in modern communication systems; historical development; advantages over conventional systems; system components and their functions; electromagnetic spectrum and spectral bands used in optical communications; principles of light propagation in different media. Incoherent optical communications: concepts and operating principles; light sources including LEDs and semiconductor lasers; modulation and direct detection; modulation formats; optical receivers and direct-detection mechanisms; receiver noise and its sources; signal-to-noise ratio (SNR) and bit error rate (BER); optical power budget; performance, applications, and limitations. Coherent optical communications: concepts and operating principles; laser characteristics; optical interference and the relationships among phase, frequency, and amplitude; homodyne and heterodyne detection; coherent transmitter and receiver architectures; digital modulation techniques including PSK, QPSK, and QAM; digital signal processing; compensation for optical-channel distortion; effects of noise, frequency offset, and phase offset; comparison with incoherent systems; applications in high-capacity optical transport networks. Multiplexing: concept and role in increasing system capacity; wavelength-division multiplexing (WDM); time-division multiplexing (TDM); dense WDM (DWDM); coarse WDM (CWDM); optical multiplexers and demultiplexers; optical

	filters and channel separation; inter-channel interference; system design and calculation of aggregate capacity and data rate; applications in optical-fiber networks. Optical networks: passive optical networks (PONs) and WDM networks; switches, routers, and optical network elements; optical add-drop multiplexers (OADMs) and optical cross-connects (OXCs); wavelength routing and resource allocation; network management, monitoring, and fault protection; applications in modern communication networks and data centers. Soliton transmission: formation and propagation in optical fibers; dispersion and pulse-shape effects; nonlinear effects, particularly the optical Kerr effect; balance between dispersion and nonlinearity; fundamental and higher-order solitons; the nonlinear Schrödinger equation and pulse propagation; effects of loss, dispersion, and pulse interaction; optical-amplifier loss compensation; advantages and practical challenges; applications in long-haul, high-speed optical communications.

TEACHING AND LEARNING STRATEGIES	
Teaching and Learning Strategies	Teaching adopts an active approach integrating theory, practical work, and problem analysis through:\n• Interactive lectures presenting theoretical concepts, fundamental laws, and mathematical derivations using the board and visual aids.\n• Tutorials and problem-solving sessions with engineering exercises under the instructor's supervision to strengthen analytical skills.\n• Self-study and homework through regular assignments that encourage continuous engagement and independent thinking.\n• Continuous assessment and quizzes, including short quizzes and in-class discussions, to monitor student understanding.

STUDENT WORKLOAD (15-WEEK SEMESTER)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	80	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	—
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

COURSE ASSESSMENT

Assessment Activity		**Duration / Quantity**	**Weight**	**Due Week(s)**	**Related Learning Outcomes**
Formative	Quizzes	4	15% (15 marks)	2, 5, 9, 12	LO1, LO2
	In-class assignments	2	10% (10 marks)	3, 10	LO2, LO3, and LO5 (as stated in source)
	Laboratory / Project	4	10% (10 marks)	Continuous	All
	Report	1	5% (5 marks)	13	LO4 and LO5 (as stated in source)
Summative	Midterm examination	2 hours	10% (10 marks)	7	LO1–LO2
	Final examination	2 hours	50% (50 marks)	16	All
—			**100% (100 marks)**	—	—

WEEKLY THEORETICAL SYLLABUS	
Week	**Topics Covered**
Week 1	Introduction to Optical Communications
Week 2	Incoherent Optical Communication Systems
Week 3	Incoherent Optical Communication Systems
Week 4	Coherent Optical Communication Systems
Week 5	Coherent Optical Communication Systems
Week 6	Coherent Optical Communication Systems
Week 7	Multiplexing in Optical Communications
Week 8	Multiplexing in Optical Communications
Week 9	Optical Amplifiers
Week 10	Optical Amplifiers
Week 11	Optical Networks
Week 12	Optical Networks
Week 13	Optical Networks
Week 14	Soliton Transmission
Week 15	Soliton Transmission

LEARNING AND TEACHING RESOURCES		
	Textbooks / Resources	**Available in Library**
Required reference	Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 8th ed., McGraw-Hill, 2012.	Yes
Recommended reference	Elements of Electromagnetics, Matthew N. O. Sadiku, 7th ed., Oxford University Press, 2018.	No
Website	—	

GRADING SCHEME				
Category	**Grade**	**Classification**	**Marks (%)**	**Definition**
Passing (50–100)	A – Excellent	Excellent	90–100	Outstanding performance.
	B – Very Good	Very Good	80–89	Above-average performance with some errors.
	C – Good	Good	70–79	Good work with noticeable errors.
	D – Satisfactory	Satisfactory	60–69	Acceptable work, but with significant deficiencies.
	E – Sufficient	Sufficient	50–59	Work meets the minimum requirements.
Failing (0–49)	FX – Fail	Fail (subject to remediation)	45–49	Further work is required, but a grade has been awarded.
	F – Fail	Fail	0–44	A substantial amount of additional work is required.

Note: Fractional marks are rounded to the nearest whole number (for example, 54.5 is rounded to 55, whereas 54.4 is rounded to 54). The university does not permit compensation for “near-pass” cases. Therefore, the only adjustment to marks awarded by the original marker(s) is the automatic rounding described above.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electronic instrumentations**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE317				
ECTS Credits	2				
SWL (hr/sem)	30				
Module Level	٢		**Semester of Delivery**	٤	
Administering Department	Electronics and Communications Engineering		**College**	College of Engineering	
Module Leader	KAREEM.DH.RAHI		**e-mail**	Kareem.rahi@qu.edu.iq	
Module Leader's Acad. Title	Assis. Professor		**Module Leader's Qualification**	Ms. C.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	18/10/2024		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. A systematic understanding and critical awareness of the importance of instrumentation. 2. A comprehensive understanding of the electronics associated with the use of instrumentation. 3. Knowledge of basic amplification and filtering circuits. 4. A comprehensive understanding of the importance of noise and their sources. 5. Knowledge of analogue to digital and digital to analogue conversion and a comprehensive understanding of their need. 6. A basic understanding of microprocessors and microcontrollers. 7. An introduction to programming microprocessors in C. 8. Some practical experience of implementing an instrumentation system.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**By the end of the module, students should be able to:** 1. Define the terms describing the use of instrumentation 2. Describe basic analogue and digital systems including bridge circuits, logic gates and amplifiers and Design simple amplification circuits 3. Identify sources of noise in electronic systems and propose remedial action 4. Specify sampling rates and resolution for data acquisition systems 5. Write basic programs in a variant of the C programming language and program a microcontroller, which will measure a dynamically changing physical quantity 6. Analyze the performance of an instrumentation system
Indicative Contents المحتويات الإرشادية	**Upon completion of the module, students will be able to:** 1. Explain the basic concepts of measurement units, measurement system applications 2. Recognize utilize instrument types of measurement 3. Recognize errors during the measurement process: sources of systematic errors, reduction systematic errors, random errors 4. Recognize calibration of measuring sensors and instruments: principle of calibration 5. Recognize measurement noise signal processing: sources of measurement noise 6. Recognize analogue signal processing operation: filtering, amplification, attenuation 7. Calculate the random errors and systematic errors 8. Recognize statistical analysis, graphical analysis 9. Recognize digital signal processing: signal sampling, sample and hold circuits

	10. Understand electrical indicating instruments and test instruments: digital meters, analogue meters, 11. Understand variable conversion elements: bridge circuit, resistance measurement Recognize signal transmission: electrical transmission, pneumatic transmission, fiber-optic transmission

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 and interactive tutorials. In this direct learning method, students work their way through a problem to find a solution. Along the way, they must develop the knowledge to understand the problem and use creative thinking to solve it.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	20	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to measurement
Week 2	Instrument types and performance characteristics
Week 3	Errors during the measurement process
Week 4	Calibration of measurement sensors and instruments
Week 5	Measurement noise signal processing
Week 6	First exam
Week 7	Measurement analogue signal, processing operation
Week 8	Measurement digital signal processing
Week 9	Electrical indicating instruments and test instruments
Week 10	Variable conversion elements
Week 11	Second exam
Week 12	Signal transmission
Week 13	Electrical transmission
Week 14	Pneumatic transmission
Week 15	Frequency measurement
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. H. Buckingham and E. N. PRICE, PRINCIPLES OF ELECTRONIC MEASUREMENTS	NO
Recommended Texts	2. A.D. HLFRICK AND W.D COOPER, MODERN ELECTRONIC 3. INSTRUMENTATION AND MEASUREMENT TECHNIQUES	NO
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Sustainability and Energy Conversion II**			**Module Delivery**	
Module Type	Core			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐**Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE321				
ECTS Credits	4.00				
SWL (hr/sem)	100				
Module Level		3	**Semester of Delivery**		6
Administering Department		ECE	**College**	ENG-QU	
Module Leader	Faris Asaad Abdulmunem		**e-mail**	faris.a.abdulmunem@qu.edu.iq	
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		01/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Electric Circuit II	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understand the types of controlled switched and operation principles like gate turn off thyristors , IGBTs, and Power MOSFET . 2. Comprehend the principles and characteristics of controlled switches. 3. Understand the working principles and types of single phase rectifiers. 4. Understand the DC-DC converters and inverter and their applications with an example for Gate derive circuit. 5. Understand the DC-AC inverter and their applications. 6. Understand the concept of Renewable source general (Solar , photovoltaic , wind) and explain renewable energy operation and circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Identify and analyze the characteristics and applications of controlled switches, such as thyristors. 2. Understand the working principles of single-phase rectifiers and their role in converting AC to DC power. 3. Analyze the operation and applications of DC-DC converters for efficient power management. 4. Explain the principles and applications of inverters in converting DC power to AC power. 5. Describe the importance and benefits of renewable energy systems in sustainable power generation. 6. Evaluate the operation and components of photovoltaic (PV) renewable energy systems. 7. Apply knowledge of the above topics to analyze, design, and troubleshoot practical scenarios related to energy conversion, renewable energy, and power electronics.
Indicative Contents المحتويات الإرشادية	**The indicative content includes the following topics:** 1. Types of Controlled Switches and Their Operating Principles: introduction to controlled power semiconductor switches, their types, characteristics, and operating principles. 2. Gate Turn-Off Thyristors (GTOs) and Power MOSFETs: construction, operating principles, switching characteristics, and

	applications of GTOs and power MOSFETs. 3. Diode Rectifiers and Single-Phase Rectifiers: basic principles of diode rectification, single-phase half-wave and full-wave rectifiers, circuit configurations, and output waveforms. 4. DC–DC Converters :fundamental principles and classifications of DC–DC converters, including step-down (buck) and step-up (boost) converters. 5. DC–DC Converters and Their Applications: operating modes, basic performance equations, output voltage control, and practical applications of DC–DC converters. 6. Inverter Principles: fundamental concepts of DC–AC conversion, inverter configurations, switching operation, and output voltage waveforms. 7. Inverter Principles and Applications: single-phase inverters, basic switching techniques, output characteristics, and applications in motor drives and renewable energy systems. 8. Gate Drive Circuits: purpose, basic configurations, operating principles, and isolation techniques of gate drive circuits for power semiconductor devices. 9. Solar Renewable Energy: fundamentals of solar energy conversion, solar energy systems, and their applications. 10. Renewable Energy Systems: Operation and Circuits: basic operating principles and circuit configurations of renewable energy systems, including photovoltaic systems, DC–DC converters, and inverters.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	70	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
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, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Types of Controlled Switches and Operation Principles.
Week 2	Gate turn off Thyristors , Power MOSFET.
Week 3	Diode rectifier , Single phase rectifier.
Week 4	DC-DC Converters.
Week 5	DC-DC Converter and Applications.
Week 6	Inverters Principles.
Week 7	Inverters Principles and Applications.
Week 8	**Mid-term Exam.**
Week 9	Gate Derive Circuits.
Week 10	Example of Gate Derive Circuit.
Week 11	Renewable Sources general.
Week 12	Solar Renewable Energy.
Week 13	Photovoltaic Renewable Energy.
Week 14	Renewable Energy Operation and Circuit.
Week 15	**Final term Examination.**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Single phase transformer Principles.
Week 2	DC Machine Principles and speed Control.
Week 3	AC Machine Principles and speed Control.
Week 4	Introduction machine Operation Methods.
Week 5	Studying the characteristics of Controlled Switches.
Week 6	Design and application of Single phase rectifier.
Week 7	Operating of Boost DC-DC Converters.
Week 8	Operating of Buck DC-DC Converters.
Week 9	**Mid-term Exam.**
Week 10	Inverter Operation and Control.
Week 11	Servo Motor Operation and Control.
Week 12	Stepper Motor Operation and Control.
Week 13	Design and application of Renewable system (part I).
Week 14	Design and application of Renewable system (part II).
Week 15	**Final term Examination.**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	PRINCIPLES OF ELECTRIC MACHINES AND POWER ELECTRONICS (THIRD EDITION) by DR.	No

	P. C. SEN.	
Recommended Texts	POWER ELECTRONICS HANDBOOK DEVICES, CIRCUITS, AND APPLICATIONS Third Edition BY Muhammad H. Rashid.	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	**ECE322**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		2	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Israa Amer Dahham		**e-mail**	Esraa.daham@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mathematics2&3	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** To Understanding the theoretical foundations of numerical analysis. **2.** To Understanding Ability to identify, formulate, and solve engineering problems . **3.** To study principles of engineering, science, and mathematics. **4.** To Ability to produce engineering designs that meet specified needs within realistic constraints. **5.** To Understanding the Ability of developing analytical and critical thinking skills. **6.** To Acquiring skills in using software and computational tools. **7.** To Understanding Enhancing logical and experimental thinking.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1.** Ability to Applying numerical methods to solve mathematical problems. **2.** The ability to analyze the structure of Designing and implementing numerical algorithms and Using computer software in numerical solutions. **3.** Ability to use testing and measuring approximations. **4.** Analyzing errors and verifying result accuracy.
Indicative Contents المحتويات الإرشادية	-Indicative content includes the following: -Ability to function effectively on teams and manage tasks and risks. -Ability to work in a team -Ability to recognize the importance of continuous professional development and lifelong learning. -Analyzing and implementing various applications of numerical analysis theory. -Study of practical applications and Handling complex data and equations. .

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will focus on encouraging active student participation in exercises to refine and expand their critical thinking skills. The module will utilize classes, interactive tutorials, and simple experiments involving sampling activities to engage and interest students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	85	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Numerical Analysis.
Week 2	Computer Calculations and Error Analysis ,quiz
Week 3	Numerical Solutions of Simultaneous Linear Equations.
Week 4	Root of Equation Finding Methods (Iterative, Mean-Value).
Week 5	Root of Equation Finding Methods (Newton-Raphson).
Week 6	Root of Equation Finding Methods (False-Position, Bisection).

Week 7	Solution of Polynomial Equations.
Week 8	Mid-term Exam.
Week 9	Solution of Polynomial Equations.
Week 10	The Interpolation Polynomial.
Week 11	Curve Fitting.
Week 12	Polynomial Fit.
Week 13	Numerical Integration.
Week 14	Numerical Differentiation.
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Numerical Methods for Engineers, 7th Edition – Steven C. Chapra & Raymond P. Canale	Yes
Recommended Texts	Numerical Methods for Engineers, 7th Edition – Steven C. Chapra & Raymond P. Canale.	No
Websites	https://www.numerical analysis courses and tutorials.	

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	Statistics and Probability			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lecture** **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE323				
ECTS Credits	**4**				
SWL (hr/sem)	**70**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	ECE		**College**	Type College Code	
Module Leader	Raheem Abd Jabur		**e-mail**	raheem_almuramudhi@qu.edu.iq	
Module Leader's Acad. Title	Asst. Prof.		**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	01/06/2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understanding Basic Statistical Concepts: The module aims to introduce students to fundamental statistical concepts such as data types, variables, population, sample, descriptive statistics, and probability.. 2. Data Collection and Sampling: Students learn about different methods of data collection, including surveys, experiments, and observational studies. They also understand the importance of sampling techniques and how to select an appropriate sample for analysis.. 3. . Probability Theory: Students gain an understanding of probability concepts, including basic principles, conditional probability, independence, and Bayes' theorem. They learn how to calculate probabilities and apply them in real- world scenarios. 4. Statistical Inference: The module aims to introduce students to the process of making inferences about populations based on sample data. They learn about confidence intervals and hypothesis testing, including concepts like null and alternative hypotheses, p-values, and significance levels.Studying the various list processing (search, sort , insert…). 5. Ethical Considerations: Some statistics modules incorporate discussions on ethical considerations in data analysis and research. Students explore topics such as data privacy, bias, and the responsible use of statistics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental concepts of probability, random variables, and probability distributions. 2. Apply probability theory and statistical methods to analyze engineering data. 3. Interpret the results of statistical analyses, including ANOVA and non-parametric tests. 4. Describe the principles of experimental design and statistical hypothesis testing. 5. Analyze engineering problems using appropriate probability and statistical techniques.
Indicative Contents المحتويات الإرشادية	Part A - In statistics, "Indicative Contents" typically refers to a general outline or a list of topics covered in a particular subject or course. The specific contents may vary depending on the level of the course, the purpose of the study, and the institution or curriculum being followed. However, here are some commonly covered topics in 166 statistics: 1. Introduction to Statistics 2. Descriptive Statistics 3. Probability 4. Statistical Inference Regression and Correlation

	Part B - Fundamentals 1. Analysis of Variance (ANOVA) 2. Non-parametric Methods 3. Experimental Design 4. Time Series Analysis 5. Multivariate Analysis

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing , When it comes to learning and teaching statistics, there are various strategies that can be effective in helping students grasp the concepts and develop a strong foundation in statistical reasoning. Here are some strategies for both learning and teaching statistics:

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	70	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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	15% (10)	5, 10	LO #1, 2, 10
	Assignments	2	10% (10)	2, 12	LO # 3, 4
	Projects / Lab.	-	-	-	-
	Report	1	15% (10)	13	LO # 5, 8
Summative assessment	**Midterm Exam**	1 hr.	10% (10)	7	LO # 1-7
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Basic concepts of probability
Week 2	Conditional probability, statistical independence
Week 3	Total probability and Baye's Theorem; Random variables
Week 4	Total probability and Baye's Theorem; Random variables
Week 5	Probability mass and density functions
Week 6	Cumulative distribution function, and moments
Week 7	Mid Exam
Week 8	Analysis of Variance (ANOVA), Common discrete and continuous distributions
Week 9	Two-way ANOVA
Week 10	ANOVA assumptions and interpretation
Week 11	Non-parametric Methods
Week 12	Chi-square test
Week 13	Chi-square test
Week 14	Mann-Whitney U test
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3,4	
Week 5,6	
Week 7	
Week 8,9	
Week10,11,12	,

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts	1- "Introduction to Probability and Statistics" by MIT and "Statistics and R" by Harvard University are excellent choices. 2- "Statistics for Business and Economics" by Paul Newbolt, William L. Carlson, and Betty Thorne: This book focuses on applying statistical methods to business and economics. It covers topics such as regression analysis, hypothesis testing, and time series analysis.	
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	**Communication systems II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE324**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level		3	**Semester of Delivery**		6
Administering Department		ECE	**College**	Type College Code	
Module Leader	Ahmed Adil Hashem		**e-mail**	Ahmed.albosham@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name		Ahmed Adil Hashem	**e-mail**	Ahmed.albosham@qu.edu.iq	
Scientific Committee Approval Date		01/06/2025	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Communication systems I	**Semester**	5
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1.** Students will demonstrate the ability to sample and analyze signals based on Nyquist Theorem. **2.** Students will understand the concept of digital modulation and demodulation techniques. **3.** Students will be able to design a multiplexing system based on the requirements (sources, BW, complexity, capacity, ...etc.) using TDM. **4.** Identify problems and restrictions and effective solution for reduction or avoiding them.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the semester, the student will be able to: 1. Understand and utilize sampling based on Nyquist theorem. 2. Understand sampling types and methods. 3. Generation and detection of different sampled signals. 4. Utilizing TDM with PAM. 5. PCM generation and detection. 6. How to minimize to effect of ISI. 7. Understanding and analysing of digital signal modulation.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Sampling and Nyquist theorem. 2. Sampling Types. 3. Pulse modulation techniques. 4. Time division multiplexing with PAM. 5. Quantization error/noise and Pulse Code Modulation PCM. 6. Bandwidth requirements for PCM. 7. SNR in PCM system. 8. Differential Pulse Code Modulation DPCM. 9. Intersymbol interference ISI. 10. Digital signal modulation techniques ASK, FSK, and PSK.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lecture Showing 2. Worked Examples 3. Interactive Lecture 4. Discussion-Based Learning 5. Case-Based Learning

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	110	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	65	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Sampling and Nyquist theorem.
Week 2	Pulse modulation.
Week 3	Generation and detection of sampled signals (PAM, PWM, and PPM).
Week 4	Properties of different sampling techniques (advantages and disadvantages).
Week 5	Time division multiplexing TDM with pulse amplitude modulation PAM
Week 6	Pulse Code Modulation PCM (Uniform quantizing, non-uniform quantizing).

Week 7	Mid-term Exam
Week 8	Pulse Code Modulation PCM (Quantization error/noise, encoding). BW requirements of a PCM system
Week 9	SNR in a PCM system
Week 10	Differential Pulse Code Modulation DPCM
Week 11	Intersymbol interference ISI Pulse shaping and raised-cosine filter.
Week 12	Digital signals modulation techniques ASK, FSK, and PSK
Week 13	Generation and detection of ASK, FSK and PSK
Week 14	M-ray digital baseband systems, M-ray digital carrier systems
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Sample Signal and Sample/Hold Signal and Its Re-Construction
Week 2	Lab 2: The Effect of Different Sampling Frequencies on The Re-Constructed Signal
Week 3	Lab 3: The Effects of Varying Duty Cycle of Sampling Frequency on The Amplitude of the Reconstructed Signal
Week 4	Lab 4: The Effect of 2nd Order and 4th Order Low Pass Filters for the Reconstruction of the Signal
Week 5	Lab 5: Modulation and Demodulation of a digital signal using ASK
Week 6	Lab 6: Modulation and Demodulation of a digital signal using FSK
Week 7	Lab 7: Modulation and Demodulation of a digital signal using PSK

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Modern digital and analog communication systems. 2. Communication systems.	Yes

Recommended Texts	Communication Systems Engineering. 2. Analog and Digital Signals and Systems. 3. An Introduction to Analog and Digital Communications.	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	**Microprocessor 8086**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE325**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Nora Ahmed Mohammed		**e-mail**	nora.mohammed@qu.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Master	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2025		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	To introduce and covering the fundamental principles of computer Architecture. 1. What is Microprocessors and Microcomputer 2. Understand the work of microprocessor in computers. 3. Types of microprocessors. 4. Understand the types of register, and the functions of each type 5. Understand the address of memory and I/O. 6. Understand the assembly language programming 7. Understand 8086 programming, integer instruction, computation, looping. 8. Understand minimum and maximum modes, Timing Diagram.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognizing the principles of microprocessor architecture. 2. Demonstration the various of microprocessor. 3. Studying the various of registers. 4. Recognizing the 8086 programming. 5. Architecture of 8086 microprocessor 6. Registers of 8086, Applicable the assembly language, Instruction Set Of 8086 7. Data transfer instructions, Arithmetic Instructions addition, subtraction, increment, and decrement. 8. Logical Instructions, control flow instruction and program structure, branching instruction 9. Interrupt, Timing Diagram, The Stack
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Demonstrate the different types and operations of microprocessors. 2- Identify and analyse the various types of registers used in microprocessors. 3- Apply the basics of 8086 programming to solve computational tasks. 4- Describe the architecture of the 8086 microprocessor. 5- Utilize 8085 registers and apply assembly language programming using its instruction set. 6- Implement data transfer and arithmetic operations (addition, subtraction, increment, decrement) in assembly language. 7- Construct logical, control flow, and branching instructions to build structured programs.

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	70	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**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, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction Microprocessor and Microcomputer
	Software Architecture of the 8085/8086 microprocessor datatype
Week 2	Segment Registers and memory segmentation, general purpose registers, status register
Week 3	Generating a memory address the stack Input/Output address
	Assembly Language programming, Instruction Set, Addressing mode
Week 4	8085/8086 programming, integer instruction and computation: Data transfer instruction, Arithmetic instruction
Week 5	8086 programming: logic instruction, shift Instruction, rotate Instruction,
Week 6	8086 programming Control Flow Instructions and program Structure
Week 7	Mid Exam
Week 8	subroutine Handling, loops, String Handling Instruction
Week 9	Flag control instruction , compare and control flow instruction
Week 10	Pin out, clock generator, buffering latching
Week 11	Minimum and Maximum Modes , Memory interfacing
Week 12	Timing , Input / output Interfacing
Week 13	I/O bus timing and Instruction
Week 14	8085/8086 Hardware specifications
Week 15	**Final**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Assembly language programming
Week 2	Lab 2: Machine language coding , Engineering A program
Week 3	Lab 3: Data transfer instruction
Week 4	Lab 4: Arithmetic operation: Addition
Week 5	Lab 5: Arithmetic operation: Subtraction
Week 6	Lab 6: logic, shift and rotate instruction

Week 7	Lab 7: subroutine and loops instruction

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Microprocessor Architecture, Programming and applications with 8085**/** Ramesh S. Goankar. Microprocessor Lab Manual	Yes
Recommended Texts		
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	**Waves Propagation**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE326**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		6	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Assist. Prof. Dr. Hayder Mazin Makki		**e-mail**		
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Assist. Prof. Dr. Hayder Mazin Makki		**e-mail**	hayder.mazen@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The course aims to provide students with a fundamental understanding of wave propagation and the behavior of electromagnetic waves in different media. It focuses on the principles of reflection, refraction, polarization, and radio wave propagation through the ground, ionosphere, and troposphere. The course also aims to develop students' abilities to analyze link power budgets, understand radar operation and radar range equations, evaluate propagation losses and environmental effects, and apply wave propagation principles to wireless communication, radar, and related engineering systems.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental concepts of wave propagation, wave parameters, and the characteristics of electromagnetic waves in free space and different media. 2. Analyze the principles of reflection, refraction, polarization, Snell's law, critical angle, and total internal reflection. 3. Describe and compare ground-wave, sky-wave, ionospheric, and tropospheric propagation mechanisms and identify the factors affecting their performance. 4. Calculate link power budgets, free-space path loss, antenna gains, propagation losses, and link margins for wireless communication systems. 5. Explain the operating principles and main components of radar systems and apply the radar range equation to evaluate radar detection performance. 6. Analyze the effects of atmospheric conditions, scattering, diffraction, multipath propagation, fading, clutter, and interference on electromagnetic wave propagation and radar performance. 7. Evaluate practical wave propagation and radar applications and interpret relevant equations, system parameters, and measurement results.
Indicative Contents المحتويات الإرشادية	**Weeks 1–3: Fundamentals of Wave Propagation** Introduction to wave propagation, wave types and parameters, electromagnetic wave characteristics, propagation in free space, polarization, propagation modes, reflection, refraction, Snell's law, critical angle, and total internal reflection. **Weeks 4–6: Radio Wave Propagation Mechanisms** Radio wave propagation, ground-wave and sky-wave propagation, ionospheric structure and propagation mechanisms, tropospheric characteristics, ducting, scattering, and factors affecting propagation. **Week 7: Mid-term Examination** Assessment of the topics covered during the first half of the course. **Weeks 8–9: Ground Wave Propagation and Link Power Budgets** Ground-wave propagation mechanisms, path loss, attenuation, link power-budget calculations, transmitting and receiving antenna gains, free-space path loss, and link margin. **Weeks 10–13: Radar Fundamentals and Applications** Radar principles and components, radar range equation, radar cross-section, target detection, propagation effects in different media, weather-related effects, clutter and interference mitigation, radar types, applications, and system design considerations. **Week 14: Advanced Wave Propagation Topics** Scattering, diffraction, multipath propagation, fading effects, channel modeling, and measurement techniques. **Week 15: Review and Recap** Review of fundamental concepts, important equations and formulas, problem-solving exercises, questions and answers, and examination preparation.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1. Interactive Lectures: Explain the theoretical principles of wave propagation, electromagnetic waves, and radar systems using presentations, diagrams, and practical examples. 2. Problem-Based Learning: Engage students in solving numerical problems involving reflection, refraction, propagation losses, link power budgets, and radar range calculations. 3. Visual and Demonstration-Based Learning: Use diagrams, simulations, animations, and illustrative examples to explain propagation mechanisms, ionospheric and tropospheric effects, and radar operation. 4. Collaborative Learning: Organize group discussions and problem-solving activities to compare propagation mechanisms, analyze environmental effects, and discuss practical communication and radar applications. 5. Practical and Application-Oriented Learning: Relate theoretical concepts to wireless communication systems, antenna performance, radar detection, and real-world propagation scenarios. 6. Formative Assessment and Feedback: Use short quizzes, homework assignments, classroom questions, and periodic feedback to evaluate student understanding and improve learning outcomes.

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

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.6
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	Weeks 4 &11	MLO1–MLO4
	Assignments	2	10	Weeks 3 &7 &13	MLO1, MLO3, MLO5
	Projects / Lab.	1	10	Week 12	MLO1–MLO٦
	Report	1	10	Week 14	MLO6
	Midterm Exam	1	10	Week 8	MLO1–MLO4

Summative assessment	**Final Exam**	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction to Wave Propagation:** Definition of wave propagation, Types of waves and their properties, Wave equation and wave parameters
Week 2	**Electromagnetic Waves:** Basic concepts of electromagnetic waves**,** Wave propagation in vacuum and free space, Wave polarization and propagation modes
Week 3	**Reflection and Refraction of EMWs:** Laws of reflection and refraction, Snell's law and critical angle**,** Total internal reflection
Week 4	**Radio Wave Propagation:** Introduction to radio wave propagation, Ground wave propagation, Sky wave propagation
Week 5	**Ionospheric Propagation:** Structure and properties of the ionosphere, Ionospheric propagation mechanisms, Factors affecting ionospheric propagation
Week 6	**Tropospheric Waves:** Troposphere and its characteristics, Tropospheric propagation mechanisms, Tropospheric ducting and scattering
Week 7	Mid-term Exam
Week 8	**Ground Wave Propagation:** Ground wave propagation mechanisms**,** Path loss and attenuation**,** Factors affecting ground wave propagation
Week 9	**Link Power-Budget Calculations:** Introduction to link power-budget calculations**,** Transmitting and receiving antenna gain, Free space path loss and link margin
Week 10	**Radar Basics:** Introduction to radar systems**,** Radar operation principles**,** Radar components and functionalities
Week 11	**Radar Range Equation:** Derivation of the radar range equation, Factors affecting radar range, Radar cross-section and target detection
Week 12	**Radar Propagation Effects:** Radar propagation in different media (air, water, etc.)**,** Weather effects on radar performance, Clutter and interference mitigation techniques
Week 13	**Radar Systems and Applications:** Types of radar systems (continuous wave, pulse, etc.)**,** Radar applications in various fields (military, weather, etc.)**,** Radar system design considerations
Week 14	**Advanced Wave Propagation Topics:** Scattering and diffraction of electromagnetic waves**,** Multipath propagation and fading effects**,** Channel modeling and measurement techniques
Week 15	**Review and Recap:** Recap of key concepts and topics covered**,** Review of important equations and formulas**,** Q&A session and exam preparation

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	

Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Antennas and Wave Propagation By: Harish, A.R.; Sachidananda, M., © 2007 Oxford University Press	Yes
Recommended Texts	Antennas and Wave Propagation, Fourth Edition, Mc Graw. Hill Companies	Yes
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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	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	**Ethics and Industrial Management**			**Module Delivery**	
Module Type	Basic			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	QU				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		3	**Semester of Delivery**		6
Administering Department		ECE	**College**	ENG-QU	
Module Leader	Asaad Sasaa Agrab		**e-mail**	asaad.saad@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ms.C.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Musa Hadi Wali	**e-mail**	Email: musa.h.wali@qu.edu.iq	
Scientific Committee Approval Date		01/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. This course aims to introduce students to the concept of industrial management and its various fields. Emphasis will be placed on the theoretical foundations and key concepts of industrial management, including design, planning, control and organization, production systems, and playback, quality, and maintenance. 2. Understand the concept of industrial management and its importance in industry and business. 3. Analyze industrial processes and apply principles of design, planning, control and organization to improve performance and increase productivity. 4. Interpretation and application of production, operation, quality and maintenance systems. 5. Identify current and future challenges in the industry and explain their impact on industrial enterprises 6. Understand the technology used in industrial management and determine the best ways to apply it to improve performance and productivity. 7. Analyze management problems related to the industry and make the right strategic decisions. 8. Understand the importance of innovation in the industry and its application for change and development. 9. Apply basic concepts and managerial skills in industrial management and improve the overall performance of industrial enterprises.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**By the end of the module, students should be able to:** 1. The ability to understand and apply the basic concepts and principles of industrial management. 2. The ability to analyze and develop industrial processes to improve performance and increase productivity. 3. The ability to understand and apply production systems, operation , quality and maintenance. 4. Ability to deal with current and future challenges in the industry. 5. An ability to understand the technology used in industrial management and to determine the best way to apply it.

	6. The ability to analyze managerial problems related to the industry and make the right strategic decisions. 7. An ability to apply basic concepts and managerial skills in industrial management.
Indicative Contents المحتويات الإرشادية	Upon completion of the module, students will be able to: 1. The ability to analyze and evaluate production and operating processes in the industry. 2. The ability to identify management problems related to the industry and apply the best management practices to solve them. 3. The ability to define and apply quality and maintenance systems in the industry. 4. The ability to use modern technologies related to production, operation and quality in the industry. 5. The ability to develop production and operation strategies to increase productivity and improve performance. 6. The ability to deal with risks associated with production and operation in the industry. 7. The ability to deal with working teams and motivate and develop them to improve performance. 8. The ability to develop and implement integrated industrial and operational production systems. 9. The ability to manage projects in the industry effectively and successfully. 10. The ability to analyze and employ data related to production and operation in industry to make the right strategic decisions.

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

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Industrial management and its various fields.
Week 2	Industrial management and its importance in industry and business
Week 3	Analyze industrial processes and apply principles of design, planning, control and organization to improve performance and increase productivity
Week 4	Interpretation and application of production, operation, quality and maintenance systems.
Week 5	Identify current and future challenges in the industry and explain their impact on industrial enterprises
Week 6	Understand the technology used in industrial management and determine the best ways to apply it to improve performance and productivity.
Week 7	first month exam
Week 8	The ability to deal with working teams, motivate and develop them to improve performance.
Week 9	The ability to develop and implement integrated industrial and operational production systems.
Week 10	Understand the importance of innovation in the industry and its application for change and development.
Week 11	Apply basic concepts and managerial skills in industrial management and improve the overall performance of industrial enterprises.
Week 12	second month exam
Week 13	Industrial management and its various fields.
Week 14	Industrial management and its importance in industry and business
Week 15	Analyze industrial processes and apply principles of design, planning, control and organization to improve performance and increase productivity
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Engineering Economy" by William G. Sullivan, Elin M. Wicks, and C. Patrick Koelling	Yes
Recommended Texts	"Operations Management" by William J. Stevenson "Design for Manufacturability Handbook" by James G. Bralla "Operations Strategy" by Nigel Slack and Michael Lewis	No
Websites	http://www.qu.edu.iq	

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	**Control systems 1**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE411**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		4	**Semester of Delivery**		7
Administering Department		ECE	**College**	Engineering	
Module Leader	Muhanad Dheya Hashim		**e-mail**	muhanad.almawlawe@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	None		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ENG 211 –mathematics III, ECE 225 Electronics II.	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1-Introduction to control systems, Definition, components, specifications, types. 2- Mathematical modeling, models for mechanical &electrical systems. 3- Transfer function, definition, types. 4- Reduction blocks technique. 5- Signal flow diagram, Mason rule. 6- Time response for TF. & steady state error.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Identify control systems. 2- How to construct mathematical model for mechanical & electrical systems. 3- Identify transfer functions, types, how to convert between them. 4- Using block reduction technique to find TF. 5- Using Mason rule to find Tf. 6- Identify stability, steady state calculations.
Indicative Contents المحتويات الإرشادية	1- What are control systems. 2- What is transfer function and the procedure to use Laplace transform. 3- How to solve physical problem using mathematical model. 4- Types of transfer function and conversion between them. 5- Reduction blocks technique for constructing TF. 6- What is time response and the relation with TF.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will focus on encouraging active student participation in exercises to refine and expand their critical thinking skills. The module will utilize classes, interactive tutorials, and simple experiments involving sampling activities to engage and interest students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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, 10	LO #1, 2
	Assignments	2	10% (10)	2, 12	LO # 3, 4, and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 4, and 5
Summative assessment	**Midterm Exam**	2 hr.	10% (10)	7	LO # 1-2
	Final Exam	2 hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to control systems
Week 2	Differential equation and how they convert to Laplace equations.
Week 3	Mathematical modeling of mechanical systems

Week 4	Mathematical modeling of electrical systems
Week 5	Transfer function, types conversion between them
Week 6	Reduction blocks technique to construct TF.
Week 7	Signal flow diagram
Week 8	Mid. exam
Week 9	Mason rule
Week 10	Time response, first order system and second order.
Week 11	Damping, types and consideration.
Week 12	Finding Time response components, calculations.
Week 13	Steady state error, calculations.
Week 14	Steady state error, calculations – 2.
Week 15	Final Exam

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

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Katsuhiko Ogata, "Modern Control Engineering ", Fifth Edition.	Yes
Recommended Texts	Norman, Nise, “Control System Engineering”, Sixth edition, John Wiley & Sons. Inc.	No
Websites	https://www.tutorialspoint.com/control_systems/control_systems_mathematical_models.htm	

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	**Information Theory and Coding**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE412				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Electronics and Communications Engineering		**College**	College of Engineering	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Students will understand the fundamentals of probability theory and random variables as the mathematical basis for modelling information sources and communication channels. 2. Students will understand the concepts of uncertainty, information content, and the entropy of a discrete memoryless source (DMS). 3. Students will demonstrate the ability to calculate conditional entropy, mutual information, entropy rate, and differential entropy. 4. Students will understand the principles of source coding, including the Kraft inequality, the source coding theorem, coding efficiency, and redundancy. 5. Students will demonstrate the ability to design and evaluate lossless source codes using Huffman, Shannon-Fano, and arithmetic coding. 6. Students will understand the run-length encoding (RLE) and Lempel-Ziv (LZ) data compression techniques. 7. Students will demonstrate the ability to model discrete channels (special and cascaded) and calculate their capacity. 8. Students will understand the capacity of the Gaussian channel (Shannon capacity) and the channel coding theorem. 9. Students will understand the principles of channel coding and error control coding, and their basic definitions. 10. Students will demonstrate the ability to encode and decode simple error-detecting and error-correcting codes (single-parity check, repetition, and Hamming codes).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognizing the principles of probability and random variables relevant to information theory. 2. Calculation of information content, entropy, conditional entropy, and mutual information. 3. Understanding the source coding theorem, Kraft inequality, coding efficiency, and redundancy. 4. Design of lossless source codes using Huffman, Shannon-Fano, and arithmetic coding. 5. Recognizing the run-length encoding (RLE) and Lempel-Ziv (LZ) compression techniques. 6. Modeling of discrete channels and calculation of their capacity. 7. Understanding the Gaussian channel capacity and the channel coding theorem. 8. Recognizing the principles of channel coding and error control coding. 9. Encoding and decoding of simple block codes (single-parity check, repetition, and Hamming codes).
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Review of probability theory and random variables: chance experiments and events, conditional probability, probability relationships, cumulative distribution function,

	probability density function, joint, marginal and conditional probability functions, transformation of random variables, statistical averages, standard probability distributions. Information modeling and source coding: uncertainty and information, the discrete memoryless source, information content of a symbol, the entropy of a DMS, Kraft inequality, source coding theorem, coding efficiency and redundancy, conditional and mutual information, conditional entropy and average mutual information, entropy rate, differential entropy. Source coding techniques: Huffman coding, source extension, Shannon-Fano coding, arithmetic coding, run-length encoding (RLE), Lempel-Ziv (LZ) encoding. Channel modeling and capacity: discrete channel models, special discrete channels, cascaded discrete channels, discrete channel capacity, Gaussian channel capacity, the channel coding theorem. Channel coding techniques: channel coding, error control coding, basic definitions, single-parity check codes, repetition codes, error-correcting parity-check codes, Hamming codes. Revision problem classes

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 and interactive tutorials. In this direct learning method, students work their way through a problem to find a solution. Along the way, they must develop the knowledge to understand the problem and use creative thinking to solve it.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
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, 10	LO # 1, 2, 3, 4 and 5
	Assignments	2	10% (10)	4, 12	LO # 1, 2, 6 and 7
	Report	1	10% (10)	14	LO # 4, 5 and 9
Summative assessment	**Test 1 (Midterm Exam)**	1 hr	10% (10)	7	LO # 1-4
	Test 2	1 hr	10% (10)	15	LO # 4-9
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Review of probability theory and random variables: chance experiments and events, what is probability, conditional probability, probability relationships.
Week 2	Random variables, cumulative distribution function (CDF), probability density function (PDF): joint, marginal and conditional probability functions, transformation of random variables, statistical averages, standard probability distributions.
Week 3	Information modeling and source coding: uncertainty and information, the discrete memoryless source (DMS), information content of a symbol, the entropy of a DMS.
Week 4	Source coding: Kraft inequality, source coding theorem, coding efficiency and redundancy, conditional and mutual information.

Week 5	Conditional entropy and average mutual information, entropy rate, differential entropy.
Week 6	Source coding techniques: digital communications, source coding theorem, Huffman coding, source extension.
Week 7	Test 1
Week 8	Shannon-Fano coding, arithmetic coding.
Week 9	Run-length encoding (RLE), Lempel-Ziv (LZ) encoding.
Week 10	Channel modeling and capacity: discrete channel models, special discrete channels, cascaded discrete channels.
Week 11	Discrete channel capacity, Gaussian channel capacity (Shannon capacity), the channel coding theorem.
Week 12	Channel coding techniques: channel coding, error control coding, basic definitions.
Week 13	Single-parity check codes, repetition codes.
Week 14	Error-correcting parity-check codes, Hamming codes.
Week 15	Test 2
Week 16	**Preparatory week before the final exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	No required textbook is specified in the approved syllabus (to be confirmed by the module leader).	
Recommended Texts	T. M. Cover and J. A. Thomas, Elements of Information Theory, 2nd Edition, Wiley, 2006. D. J. C. MacKay, Information Theory, Inference, and Learning Algorithms, Cambridge University Press, 2003. S. Lin and D. J. Costello, Error Control Coding, 2nd Edition, Pearson, 2004.	
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	**Microwave Engineering**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE413**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		4	**Semester of Delivery**		7
Administering Department		ECE	**College**	Type College Code	
Module Leader	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**		
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**	hayder.hamzah@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Introduce students to the fundamental principles of microwave engineering and electromagnetic-wave propagation in guided structures. 2. Develop students' understanding of rectangular and cylindrical waveguides, including their field equations, propagation modes, cutoff frequencies, and transmission characteristics. 3. Explain the operating principles and characteristics of rectangular and cylindrical cavity resonators, including resonant frequency, quality factor, and coupling coefficients. 4. Familiarize students with microwave hybrid circuits, microwave network analysis, and scattering parameters (S-parameters). 5. Develop students' knowledge of microwave components, including directional couplers, circulators, and isolators, and their applications in microwave systems. 6. Introduce planar transmission-line structures and their role in microwave and millimeter-wave circuits. 7. Provide students with an understanding of microwave power sources and their role in generating microwave energy. 8. Develop students' ability to analyze microwave structures and solve related engineering problems using appropriate equations, calculations, and physical interpretations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental concepts of microwave engineering and distinguish waveguides from conventional transmission lines. 2. Describe the structure, operating principles, and field configurations of rectangular and cylindrical waveguides. 3. Derive or apply the relevant field equations for transverse electric (TE) and transverse magnetic (TM) modes. 4. Calculate cutoff frequencies, propagation constants, guide wavelengths, phase velocities, group velocities, and wave impedances for specified waveguide modes. 5. Analyze power transmission and attenuation in waveguides, including dielectric and conductor losses. 6. Determine resonant frequencies and operating modes of rectangular and cylindrical cavity resonators. 7. Explain cavity-resonator quality factor and distinguish unloaded and loaded Q factors and critical, over-, and undercoupling. 8. Explain the operating principles and applications of microwave hybrid circuits, including waveguide tees, hybrid rings, and directional couplers. 9. Interpret two-port S-parameters and evaluate reflection, transmission, insertion loss, and return loss. 10. Describe the operating principles and applications of microwave components, including circulators and isolators. 11. Compare planar transmission-line structures, particularly stripline and microstrip configurations, in terms of structure and propagation characteristics.

	12. Explain the role and basic operating principles of microwave power sources and apply the module's analytical methods to solve representative microwave-engineering problems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Introduction to Microwave Engineering • Microwave frequency range and guided electromagnetic energy. • Waveguides and transmission lines. • Cutoff frequency and the characteristics of guided-wave propagation. 2. Rectangular Waveguides • Structure, dimensions, and materials. • Maxwell's equations and waveguide field equations. • TE and TM modes and their field distributions. • Dominant mode and cutoff conditions. • Propagation constant, guide wavelength, phase velocity, group velocity, and wave impedance. • Power transmission, dielectric losses, conductor losses, and mode excitation. 3. Cylindrical Waveguides • Cylindrical-waveguide fundamentals and field equations. • TE and TM modes. • Bessel functions and cutoff conditions. • Propagation characteristics and power losses. • Coaxial transmission-line characteristics as covered in the lectures. 4. Cavity Resonators • Rectangular and cylindrical cavity structures. • Resonant modes and resonant-frequency calculations. • Quality factor (Q), stored energy, and power losses. • Unloaded and loaded Q factors. • Coupling coefficients: critical coupling, overcoupling, and undercoupling. 5. Microwave Hybrid Circuits • Microwave junctions and waveguide tees. • E-plane tee, H-plane tee, and magic tee. • Hybrid-ring or rat-race circuits. • Directional couplers and circulators. 6. Microwave Network Analysis • Scattering parameters and their matrix representation. • Two-port networks: (S11, S12, S21, and S22).

	• Input and output reflection coefficients. • Forward and reverse transmission. • Insertion loss and return loss. 7. Microwave Components • Directional couplers. • Microwave circulators. • Microwave isolators and their operating principles. • Applications in microwave signal transmission and generator protection. 8. Planar Transmission Lines • Planar transmission-line structures. • Stripline geometry, TEM propagation, and characteristic impedance. • Microstrip structure and quasi-TEM propagation. • Effective dielectric constant, phase velocity, propagation constant, and characteristic impedance. • Conductor and dielectric attenuation. 9. Microwave Power Sources • Microwave generation and electron-beam interaction. • Klystron oscillators and reflex klystrons. • Construction, operating principles, and applications of the sources presented in the lectures.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Interactive lectures: Explain electromagnetic principles, waveguide modes, resonator behaviour, microwave circuits, and component operation using equations, diagrams, and field-distribution illustrations. 2. Worked examples and problem-solving: Guide students through calculations involving cutoff frequencies, propagation constants, guide wavelengths, phase velocities, power transmission, attenuation, resonant frequencies, and Q factors. 3. Diagram-based learning: Use field patterns, circuit diagrams, waveguide structures, equivalent circuits, and S-parameter matrices to strengthen conceptual understanding. 4. Comparative learning: Encourage students to compare TE and TM modes, rectangular and cylindrical waveguides, cavity resonators, and stripline and microstrip structures.

	5. Guided analytical exercises: Provide problems involving two-port networks, reflection and transmission coefficients, insertion loss, return loss, and coupling characteristics. 6. Application-oriented discussion: Relate microwave components and power sources to practical microwave systems, including signal transmission, impedance matching, and protection of microwave generators. 7. Formative assessment: Use short quizzes, oral questions, in-class numerical exercises, homework, and periodic review to monitor learning progress. 8. Revision and feedback: Review challenging concepts and numerical problems, address common errors, and provide feedback before the final assessment.

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	٥
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	Weeks 4, 10	MLO1–MLO7
	Assignments	2	20	Weeks ٦, ١٣	MLO3–MLO12
	Projects / Lab.	N/A	N/A	N/A	N/A
	Report	1	10	Week ١٤	MLO9–MLO11
Summative assessment	**Midterm Exam**	1	10	Week 8	MLO1–MLO7
	Final Exam	2 hr.	50% (50)	Final examination period	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Microwave Engineering: Microwave frequency range, applications, transmission lines versus waveguides, and fundamental rectangular waveguide concepts
Week 2	Waveguide Field Equations: Maxwell's equations, boundary conditions, and electromagnetic field components inside waveguides
Week 3	Rectangular Waveguide Modes: TE and TM modes, dominant mode TE_{10}, mode characteristics, and cutoff frequency
Week 4	Waveguide Propagation Characteristics: Propagation constant, guide wavelength, phase velocity, group velocity, and wave impedance
Week 5	Power Transmission in Rectangular Waveguides: Power flow, excitation, attenuation, and waveguide losses
Week 6	Cylindrical Waveguide Fundamentals: Field equations, boundary conditions, TE and TM modes, and Bessel functions
Week 7	Cylindrical Waveguide Modes: Mode characteristics, cutoff frequencies, propagation, and comparison with rectangular waveguides
Week 8	Midterm Examination and Review: Assessment of the material covered in Weeks 1–7
Week 9	Rectangular Cavity Resonators: Resonance principles, resonant modes, resonant frequencies, and field distributions
Week 10	Cylindrical Cavity Resonators: Resonant modes and frequencies, quality facto
Week 11	Microwave Hybrid Circuits: E-plane and H-plane tees, magic tee, hybrid ring, and directional couplers
Week 12	Microwave Network Analysis: Scattering parameters (S11, S12, S21, S22), reflection and transmission coefficients, return loss, and insertion loss
Week 13	Microwave Components: Directional couplers, circulators, and isolators; operating principles and practical applications
Week 14	Planar Transmission Lines: Stripline and microstrip structures, TEM and quasi-TEM propagation, effective dielectric constant, characteristic impedance, and losses
Week 15	Microwave Power Sources: Klystron and reflex klystron principles and operation; comprehensive course review

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

Week 1	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Microwave Engineering	Yes
Recommended Texts	microwave devices and circuits	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	**Digital Signal Processing 1**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE414				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	4		**Semester of Delivery**	7	
Administering Department	ECE		**College**	College of Engineering	
Module Leader	Dr. Yousif Mohsin Hasan		**e-mail**	yousif.hasan@qu.edu.iq	
Module Leader's Acad. Title	Assis. Professor		**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	18/10/2024		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Students will demonstrate the ability to recognize different types of signals. 2. Students will understand the advantages of digital over analogue signal processing. 3. Students will demonstrate the ability to classify continuous and discrete signals. 4. Students will demonstrate the ability to recognize and classify discrete time system (Linearity, Time invariant, Causality, Memoryless, BIBO Stability, Recursive and Non recursive systems). 5. Students will demonstrate the ability to sample analog signals and convert to digital signals. 6. Students will demonstrate their ability to calculate convolution sum and properties. 7. Students will understand the concepts of Finite-Duration & Infinite-Duration Impulse Response (FIR & IIR). 8. Students will demonstrate the ability to understand Impulse Response of LTI Systems. 9. Students will demonstrate the ability to solve the Difference Equations. 10. Students will demonstrate the ability to do realization structures of LTI systems (FIR and IIR). 11. Students will demonstrate the ability to understand Autocorrelation and Cross correlation Sequence and properties for Discrete-Time Signals.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognizing the principles of signal and system. 2. Classification of discrete time system. 3. Demonstration of the sampling analogue signals. 4. Recognize the impulse response of LTI system. 5. Calculation the convolution sum of the discrete time signals. 6. Recognize the FIR and IIR systems. 7. Solution of difference equations. 8. Realization Structures of LTI Systems. 9. Calculation the autocorrelation and cross correlation sequence and properties for Discrete-Time Signals.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Signals, Systems and Signal Processing. Basic Elements of DSP System, Advantages of Digital over Analogue Signal Processing. Types of Signals. The Concept of Frequency in Continuous and Discrete-Time Signals. Sampling of Analogue Signals. Discrete-Time signals and Systems: Classifications & Manipulation. Input-Output Discerption, Resolution of Discrete-Time Signals into impulses, Response of LTI Systems to Arbitrary Inputs: Convolution Sum and properties, Casual LTI Systems. Stability. Finite-Duration & Infinite-Duration Impulse Response (FIR & IIR). Recursive and Non recursive systems, Impulse Response of LTI Recursive Cascaded Systems Difference Equations and their Solution, Realization Structures of LTI Systems.

	Autocorrelation and Cross correlation Sequence and properties for Discrete-Time Signals. Revision problem classes

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 and interactive tutorials. In this direct learning method, students work their way through a problem to find a solution. Along the way, they must develop the knowledge to understand the problem and use creative thinking to solve it.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**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, 10	LO #1, 2, 8 and 9
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 9
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Signals, Types of Signals, The Concepts of Frequency in Continuous and Discrete Time Signals.
Week 2	Systems and Signal Processing. Basic Elements of DSP System, Advantages of Digital over Analogue Signal Processing.
Week 3	Signal Sampling and Quantization, Discrete Time Signals, Classification & Manipulation, Discrete Time Systems, Input/output discerption, Classifications & Interconnection.
Week 4	Analysis of Discrete Time LTI systems, Resolution of Discrete Time Signals into impulses,
Week 5	Response of LTI systems to Arbitrary input,
Week 6	Convolution Sum, Properties of Convolution,
Week 7	Mid-term Exam
Week 8	Interconnection of LTI systems, Casual LTI systems, Stability, systems with Finite – Duration and infinite Duration
Week 9	Recursive and non-recursive Discrete Time Systems
Week 10	Discrete Time Systems Describe by Difference Equations
Week 11	Solution of Linear Constant-Coefficient Difference Equations.
Week 12	Impulse Response of LTI Recursive systems
Week 13	Structures for the Realization of LTI systems
Week 14	Correlation of Discrete Time Signals, Properties of Autocorrelation and Cross correlation

	Sequence,
Week 15	Correlation of Periodic Signals, Input/output Correlation
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Basic Instructions in Matlab
Week 2	Generation of sine wave
Week 3	Basic sequences and operations– part1
Week 4	Basic sequences and operations– part2
Week 5	Basic sequences and operations– part3
Week 6	Sampling and aliasing in MATLAB
Week 7	Upsampling and Downsampling in MATLAB
Week 8	Reconstruction of a sampled signal in MATLAB
Week 9	Mid-term Exam
Week 10	Convolution and Discrete LTI System Response
Week 11	Verification of Convolution Properties in MATLAB
Week 12	Solving Difference Equation in MATLAB.
Week 13	Correlation (autocorrelation and cross correlation) in MATLAB

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	J. G. Proakis and D. G. Manolakis Digital Signal Processing: Principles, Algorithms, and Applications, 3rd Edition	No
Recommended Texts	Digital Signal Processing System Analysis and Design, Second Edition Paulo S. R. Diniz, Eduardo A. B. da Silva, and Sergio L. Netto Discrete-time Signal Processing, 3rd Edition A. Oppenheim and R. Shaffer	

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

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MODULE DESCRIPTION FORM

معلومات المادة الدراسية					
عنوان الوحدة	**Digital System Design DSD**			تسليم الوحدات	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
نوع الوحد	**Core**				
رمز الوحة	**ECE415**				
ECTS وحدات المادة	**5**				
SWL (hr/sem)	**125**				
مستوى الحدة	8	الفصل الدراسي	1		
رمز القسم	ECE	الكلية	Engineering College		
استاذ الوحدة	Prof. Dr. Mazen Al Ibraheemi	الايميل	Mazen.ali@qu.edu.iq		
اللقب الاكاديمي لاستاذ الودة	Prof.	مؤهلات استاذ الوحدة	Doctoral		
مدرس الوحدة	Prof. Dr. Mazen Al Ibraheemi	الايميل	Mazen.ali@qu.edu.iq		
اسم المراجع		الايميل			
تاريخ موافقة اللجنة العلمية	01/06/2025	رقم الاصدار	1.0		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Digital Electronic	**Semester**	3
Co-requisites module	Digital Electronic	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	Student will recognize: 1. Basic principles required for DSDs. 2. Connection between this subject and the relative subjects in the previous learning stages 3. Methods of interface between a microprocessor and peripheral devices 4. Programmable interfacing units 5. Dedicated ICs for serial/parallel computer communications. 6. Display/keyboard interfacing. 7. Dedicated ICs for programmable interrupt 8. ICs of direct memory access 9. ICs of interval timing
Module Learning Outcomes	Student will be able to 1. Understand the basics knowledges of interfacing systems . 2. Make connection between this subject and the relative subjects in the previous learning stages 3. Define the methods of interface between a microprocessor and peripheral devices 4. Explain the Programmable interfacing units 5. Specify the Dedicated ICs for serial/parallel computer communications. 6. Analysis the Display/keyboard interfacing. 7. Use Dedicated ICs for programmable interrupt 8. Define and use the ICs of direct memory access 9. Employ the ICs of interval timing in the proper mode.
Indicative Contents:	Indicative Contents: 1- Introduction in DSD • Why it is important to study the DSD? • Methods of digital interface • Differentiate between digital interface units and the priority of one of themm over the others. • تمييز الفرق بين انظمة التداخل الرقمي و افضليتها حسب متطلبات التطبيق. 2- Methods of interfacing • Isolated I/O mapping and memory mapping • Word-Wide and Byte-wide 3- Exercises • Interfacing by non-programmable units

	• Interfacing by programmable units 4- Explaining and learning the dedicated interfacing ICs • Serial/parallel communication ICs • Time interval ICs • programmable interrupt ICs • display/keyboard interfacing • ICs of direct memory access and modes of operation

Learning and Teaching Strategies	
Learning and Teaching Strategies	1. Interactive lectures for knowledge exchange between the lecturer and students regarding the importance of the DSD subject 2. Reviewing the exercises of references related to the DSD subject 3. Reviewing the solved problems of digital interfacing 4. Learning of DSD based on computer applications 5. Learning through comparing the different types of DSD methods 6. Students course assessments, periodic reviewing, quizzes, short exams, discussions, and HomeWorks.

Student Workload (SWL)			
Structured SWL (h/sem)	٧٨	**Structured SWL (h/w)**	٥
Unstructured SWL (h/sem)	٤٧	**Unstructured SWL (h/w)** ١	٣
Total SWL (h/sem)	١٢٥		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10	Weeks 4, 10	MLO1–MLO9
	Assignments	4	20	Weeks ٦, ١٣	MLO3–MLO9
	Projects / Lab.	٢	١٠	Week 9	MLO1–MLO9
	Report	1	10	Week ١٤	MLO1–MLO9
Summative assessment	Midterm Exam	1	10	Week 8	MLO1–MLO7
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

Week	Material Covered
Week 1	Types of Inputs/Outputs, Isolated I/O Interface, I/O data transfer and instructions
Week 2	Byte-Wide output ports and Byte-Wide input ports using isolated I/O
Week 3	Input/Output Handshaking and parallel interfacing
Week 4	82C55A Peripheral Programmable Interface
Week 5	82C55A implementation of parallel I/O ports, Memory-Mapped I/O ports
Week 6	82C54 programmable interval timer
Week 7	Midterm exam I
Week 8	82C37 programmable direct memory access controller
Week 9	Serial communications interface and programmable communications interface controllers
Week 10	Keyboard and display interface
Week 11	Interrupt mechanism, types, and priority. Interrupt vector table and instructions
Week 12	External hardware interrupt interface and interrupt sequence
Week 13	82C59A Programmable interrupt controller
Week 14	Interrupt interface circuits using the 82C59A. Software, nonmaskable, and reset interrupt.
Week 15	Cont.

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Intoduction
Week 2	Integrate circuit 74LS138 decoder
Week 3	Integrate circuit 74LS373 Octal Latch
Week 4	Integrate circuit 74LS245 Bi-direction I/O unit
Week 5	Integrate circuit 8255 PPI mode0
Week 6	Integrate circuit 8255 PPI mode1
Week 7	Integrate circuit 8255 PPI mode2
Week 8	Integrate circuit 8254 interval timer
Week 9	Mid exam
Week 10	Integrate circuit 8251 serial/parallel communication
Week 11	Integrate circuit 8259 programmable interrupt
Week 12	Integrate circuit 8237
Week 13	Integrate circuit 8279
Week 14	Software Simulation training 1
Week 15	Software Simulation training 2

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	The 8088 and 8086 Microprocessors_Walter_4th ed_book	Yes
Recommended Texts	Ramesh_S_Gaonkar_Microprocessor_Architecture,_Programming,_and_Applications	Yes
Websites	https://www.geeksforgeeks.org/system-design/principles-in-digital-system-design/	

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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Networks And Communication Protocol 1**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE417**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		4	**Semester of Delivery**		7
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Assist. Prof. Dr. Hayder Mazin Makki		**e-mail**		
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Assist. Prof. Dr. Hayder Mazin Makki		**e-mail**	hayder.mazen@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to provide students with a comprehensive understanding of the fundamental principles, architectures, technologies, and protocols used in modern computer networks and data communication systems. It covers network topologies and architectures, the OSI and TCP/IP reference models, data transmission, Ethernet and wireless networks, IP addressing and routing, transport-layer protocols, and application-layer services. The module also equips students with the practical skills required to analyse, configure, and troubleshoot computer networks using network simulation environments.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students will be able to: 1. **Explain** the fundamental concepts, components, architectures, and classifications of computer networks, including LAN, WAN, and MAN. 2. **Compare and analyze** network topologies, communication architectures, and the OSI and TCP/IP reference models, including the functions of their individual layers. 3. **Analyze** data transmission processes, including analog and digital signals, transmission media, data encoding, and common transmission impairments such as noise, attenuation, and distortion. 4. **Explain and apply** Ethernet concepts, MAC addressing, framing, error detection and correction, flow control, and media access control mechanisms. 5. **Calculate and configure** IPv4/IPv6 addressing, subnetting, and CIDR, and **analyze** IP packet structures and network routing concepts. 6. **Implement and evaluate** static and dynamic routing protocols, including RIP, OSPF, and EIGRP, and analyze routing decisions and path selection. 7. **Explain and analyze** TCP and UDP communication, port numbers, connection establishment and termination, flow control, congestion control, and socket-based communication. 8. **Configure and evaluate** common application-layer network services and protocols, including HTTP/HTTPS, FTP, SMTP, POP, DNS, and DHCP. 9. **Apply** basic network security principles related to confidentiality, integrity, availability, and traffic filtering in simulated network environments. 10. **Design, configure, test, and troubleshoot** computer networks using a network simulation environment such as Cisco Packet Tracer.
Indicative Contents المحتويات الإرشادية	1. Introduction to Computer Networks: Uses and applications of computer networks, basic networking components, network classifications (LAN, WAN, MAN), network architectures, and network topologies (Bus, Star, Ring, Mesh). 2. Internet and Network Architectures: Introduction to the Internet and World Wide Web, client-server and peer-to-peer architectures, network devices, and basic communication models. 3. Network Reference Models: OSI and TCP/IP layered architectures, functions of each layer, comparison between OSI and TCP/IP models, encapsulation and decapsulation processes. 4. Data Communication Fundamentals: Data and signals, analog and digital transmission, transmission media (copper, fiber optic, radio, and satellite), data encoding, bandwidth, and transmission impairments including noise, attenuation, and distortion. 5. Data Link Layer and Ethernet: Framing, MAC addressing, Ethernet operation, error detection and correction, flow control, Media Access Control (MAC) protocols, and ARP. 6. Wireless Networks and Switching: Wireless LANs and IEEE 802.11 standards, switching concepts, MAC address-table learning, VLANs, trunking, and basic inter-VLAN communication.

	7. Network Layer and IP Addressing: IPv4 and IPv6 addressing, subnetting, CIDR, IP packet structure, address resolution, routing concepts, shortest-path routing, distance-vector and link-state approaches. 8. Routing Protocols: Static routing and dynamic routing, RIP, OSPF, EIGRP, routing tables, path selection, and practical configuration and analysis of routing protocols. 9. IPv6 Networking: IPv6 addressing and packet structure, IPv6 routing, IPv4/IPv6 coexistence, and transition mechanisms. 10. Transport Layer Protocols: Process-to-process communication, TCP and UDP protocols, port numbers, TCP connection establishment and termination, flow control, reliability, and congestion control. 11. Application Layer Protocols and Network Services: HTTP, HTTPS, FTP, SMTP, POP, DNS, DHCP, client-server communication, and basic socket programming concepts. 12. Network Security and Practical Simulation: Fundamental security principles including confidentiality, integrity, and availability; basic traffic filtering and access control; network configuration, testing, troubleshooting, and protocol analysis using simulation environments such as Cisco Packet Tracer.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Delivery of theoretical concepts, networking architectures, communication protocols, layered models, and network technologies through lectures and presentation slides. 2. Practical Problem Solving: Worked examples and exercises on IP addressing, subnetting, CIDR, routing, protocol operation, error detection, flow control, and network performance to develop students' analytical and problem-solving skills. 3. Diagrammatic and Protocol Analysis: Visual analysis of network topologies, OSI and TCP/IP layered architectures, packet/frame structures, protocol interactions, routing tables, and data encapsulation/decapsulation to understand the flow of information across networks. 4. Simulation-Based Learning: Hands-on implementation of networking concepts using a network simulation environment such as Cisco Packet Tracer, including LAN configuration, VLANs, routing protocols, IPv4/IPv6 addressing, TCP/UDP communication, and application-layer services. 5. Case Studies and Comparative Analysis: Analysis and comparison of LAN/WAN technologies, TCP vs. UDP, IPv4 vs. IPv6, static vs. dynamic routing, and different network architectures and protocols using practical networking scenarios. 6. Self-Study: Reviewing lecture materials, protocol diagrams, configuration examples, and simulation exercises, while attempting additional networking problems and practical scenarios to reinforce theoretical and laboratory learning.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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	Weeks 4 &11	MLO1–MLO4
	Assignments	2	10	Weeks 3 &7 &13	MLO1, MLO3, MLO5
	Projects / Lab.	2	10	Week 12	MLO1–MLO٦
	Report	1	10	Week 14	MLO6
Summative assessment	**Midterm Exam**	1	10	Week 8	MLO1–MLO4
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Uses of Computer Networks; Network Types and Classifications (LAN, WAN, MAN); Network Topologies (Bus, Star, Ring, Mesh)**
Week 2	**The Internet and World Wide Web; Network Architectures (Client-Server, Peer-to-Peer).**
Week 3	**Layered architecture of OSI and TCP/IP models; Functions of each layer (Physical, Data Link, Network, Transport, Application)**
Week 4	**Encapsulation and decapsulation; Comparison of OSI and TCP/IP**
Week 5	**Data and Signals (analog and digital); Transmission Media (guided - copper, fiber optic; unguided - radio, satellite);**
Week 6	**Data Encoding; Transmission Impairments (noise, attenuation, distortion).**

Week 7	**MAC sublayer; Error Detection and Correction; Framing; Flow Control; Media Access Control protocols (CSMA/CD, Ethernet)**
Week 8	**Midterm Examination and Review: Assessment of the material covered in Weeks 1–7**
Week 9	**Wireless LANs (802.11 a/b/g/n/ac); Introduction to switching concepts**
Week 10	**IP Addressing (IPv4, IPv6, subnetting, CIDR); IP Packet structure; Routing concepts (shortest path, distance vector, link state)**
Week 11	**Routing protocols (RIP, OSPF, EIGRP); IP version 6 addressing and transition mechanisms**
Week 12	**Process-to-Process communication; TCP and UDP protocols; Port numbers**
Week 13	**Connection establishment and termination (TCP); Congestion control; Flow control; Socket Programming introduction**
Week 14	**Application Layer Protocols (HTTP, HTTPS, FTP, SMTP, POP, DNS, DHCP)**
Week 15	**Client-server architecture; Network security concepts (confidentiality, integrity, availability)**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Introduction to Cisco Packet Tracer; create and test Bus, Star, Ring, and Mesh topologies; connect PCs, switches, and routers; test connectivity using ping.**
Week 2	**Build a LAN using PCs, switches, and routers; configure Ethernet interfaces; assign IP addresses; test connectivity and examine MAC addresses.**
Week 3	**Simulate client-server and peer-to-peer architectures; configure servers and clients; test basic network services and communication.**
Week 4	**Use simulation/packet-capture mode to observe data transmission through the protocol layers; analyze encapsulation, headers, and decapsulation.**
Week 5	**Simulate different transmission media and network conditions; investigate bandwidth, delay, attenuation, noise, and packet loss; compare network performance.**
Week 6	**Examine Ethernet frames and MAC addresses; study ARP operation; configure switches; observe frame forwarding and MAC address-table learning.**
Week 7	**Create multiple VLANs; assign switch ports; configure trunk links; implement Inter-VLAN routing using a router or Layer-3 switch.**
Week 8	**Design IPv4 networks; perform subnetting and CIDR calculations; configure hosts and router interfaces; verify subnet connectivity.**
Week 9	**Configure static routes and compare them with dynamic routing; implement RIP, OSPF, and/or EIGRP; examine routing tables and path selection.**
Week 10	**Configure IPv6 addresses; implement IPv6 routing; test IPv6 connectivity; investigate IPv4/IPv6 coexistence and transition mechanisms.**
Week 11	**Simulate TCP and UDP communication; examine port numbers, connection establishment/termination, flow control, and reliability; compare TCP and UDP behavior.**
Week 12	**Configure and test HTTP/HTTPS, DNS, DHCP, FTP, SMTP/Email services; implement basic network security concepts such as ACLs, authentication, and traffic filtering.**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Stallings, W. (2014). Network Security Essentials: Applications and Standards (5th ed.). Pearson	Yes
Recommended Texts	Forouzan, B. A. (2013). *Data Communications and Networking* (5th ed.). McGraw-Hill.	Yes
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.

نموذج وصف المادة الدراسية

معلومات المادة الدراسية					
عنوان الوحدة	**VLSI**			تسليم الوحدات	☒ نظري ☒ محاضرة ☐ مختبر ☐ مناقشة ☐ تطبيقات ☐ تقارير
نوع الوحد	**Core**				
رمز الوحة	**ECE421**				
وحدات المادة **ECTS**	**4**				
SWL (hr/sem)	**100**				
مستوى الحدة	٨	الفصل الدراسي		2	
رمز القسم	ECE	الكلية	الهندسة / جامعة القادسية		
استاذ الوحدة	Prof, Dr. Mazen Al Ibraheemi	الايميل	Mazen.ali@qu.edu.iq		
اللقب الاكاديمي لاستاذ الودة	Prof	مؤهلات استاذ الوحدة		دكتوراه	
مدرس الوحدة	Prof, Dr. Mazen Al Ibraheemi	الايميل	Mazen.ali@qu.edu.iq		
اسم المراجع		الايميل			
تاريخ موافقة اللجنة العلمية	01/06/2025	رقم الاصدار	1.0		

Relation with other Modules			
الوحدة الاساسية المطلوبة	Electronics 3	الفصل الدراسي	Fifth
وحدة المتطلبات الاساسية	Electronics 3	الفصل الدراسي	Fifth

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية	Recognizing the student the: 1. basic principles related to the subject 2. the various generation of the ICs 3. The various families of digital ICs 4. ICs based on CMOS 5. Basic steps for ICs design 6. Various methods of ICs fabrications and steps. 7. Main Properties of ICs 8. Dynamic CMOS ICs
مخرجات التعلم للمادة الدراسية	The student will be able to 1. Specify the basics of ICs. 2. Define the chronological of ICs improvements 3. Classify the ICs according to principle of operation 4. Descipe and analysis the ICs of CMOS transistors 5. Design ICs of different functions 6. Explain the steps of ICs fabrication 7. Determine the parameters effect on operation of ICs 8. Distinguish the dynamic CMOS ICs
المحتويات الإرشادية	Indicative Contents: 1- Brief introduction to importance of ICs • Why we need the ICs • Historical view • Differentiate among ICs regarding transistors density 2- Design of digital cicuits by CMOS transistors • By PMOS. • By NMOS • By CMOS and PMOS 3- Analytical exercises • Circuits based of NAND • Circuits of NOR • Circuits of multi-terms function 4- Properties of CMOS circuits • Effects of parasitic input capacitors • Effect of parasitic output capacitors

	5- fabrication of CMOS ICs / Cascade steps 6- Dynamic CMOS ICs • Differences with static ICs. • Controlling of operation by timing pulse • Different types for dynamic ICs

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	1. Interactive lectures for knowledge exchange between the lecturer and students regarding the importance of ICs 2. Reviewing the exercises of references related to the subject 3. Reviewing the solved problems of ICs fabrication 4. Learning of ICs fabrication based on computer applications 5. Learning through comparing the different types of ICs 6. Students course assessments, periodic reviewing, quizzes, short exams, discussions, and homeworks.

Student Workload (SWL)			
Structured SWL (h/sem)	٦٢	**Structured SWL (h/w)**ا	٤
Unstructured SWL (h/sem)	٣٨	**Unstructured SWL (h/w)**	٣
Total SWL (h/sem)	١٠٠		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10	Weeks 4, 10	MLO2, MLO3, MLO5, MLO7
	Assignments	4	20	Weeks ٦, ١٣	MLO1, MLO4, MLO6, MLO8
	Projects / Lab.	N/A	N/A	N/A	N/A
	Report	1	10	Week ١٤	MLO2, MLO3, MLO6
Summative assessment	Midterm Exam	1	10	Week 8	MLO1 – MLO7
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

Learning and Teaching Resources

الاسبوع	المواد المشمولة
الاسبوع 1	Silicon lattice, Dopants, p-n junctions, n MOS transistors, n MOS operation, p MOS transistors, transistors as switches.
الاسبوع 2	CMOS inverter, CMOS NAND gate, CMOD NOR gate, 3-input NAND gate.
الاسبوع 3	Cont.
الاسبوع 4	CMOS fabrication, implementation, inverter cross-section, fabrication, layout, simplified design rules.
الاسبوع 5	Cont.
الاسبوع 6	A brief history, CMOS gate design, pass transistors.
الاسبوع 7	Cont.
الاسبوع 8	CMOS latches, & flip-flops, standard cell layouts, stick diagrams.
الاسبوع 9	Mid Exam
الاسبوع 10	MOS capacitors, n MOS I-V characteristics, p MOS I-V characteristics, gate and diffusion capacitance.
الاسبوع 11	Cont.
الاسبوع 12	Nonideal transistors behavior, high field effects, mobility degradation, velocity saturation, channel length modulation.
الاسبوع 13	Cont.

14 الاسبوع	Threshold voltage effects, body effect, Drain-induced barrier lowering, short channel effect.
15 الاسبوع	Leakage, subthreshold leakage, gate leakage, junction leakage, process and environmental variation.
	Pass transistors, DC response, logic levels and noise margins.

المنهاج الاسبوعي للمختبر	
	المواد المشمولة
1 الاسبوع	
2 الاسبوع	
3 الاسبوع	
4 الاسبوع	
5 الاسبوع	
6 الاسبوع	
7 الاسبوع	
8 الاسبوع	
9 الاسبوع	
10 الاسبوع	
11 الاسبوع	
12 الاسبوع	
13 الاسبوع	
14 الاسبوع	
15 الاسبوع	

مصادر التعلم والتدريس		
	الكتب المنهجية	هل توجد في المكتبة
المصادر المطلوبة	CMOS Integrated Circuit Simulation with LTspice	نعم(pdf)
المصادر المقترحة	Cmos Logic Circuit Design	نعم
مواقع الكترونية		

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
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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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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	**Networks And Communication Protocol 2**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE422**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		8	**Semester of Delivery**		2
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Assist. Prof. Dr. Hayder Mazin Makki		**e-mail**		
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Assist. Prof. Dr. Hayder Mazin Makki		**e-mail**	hayder.mazen@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to provide students with a comprehensive understanding of network security, cryptography, wireless communication technologies, network monitoring, and performance management. It covers symmetric and asymmetric encryption, firewalls, intrusion detection systems, virtual private networks (VPNs), common network security threats, wireless LAN security, cellular networks, mobile IP, and Bluetooth communication. The module also aims to develop students' practical skills in configuring, monitoring, securing, and evaluating computer networks using simulation and network analysis tools.

	Furthermore, it introduces emerging networking technologies, including Software-Defined Networking (SDN), Network Functions Virtualization (NFV), and the Internet of Things (IoT), preparing students to analyse and design secure, reliable, and efficient network systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**By the end of this module, students will be able to:** **1.** Explain the fundamental principles of network security, cryptography, and secure communication, including symmetric and asymmetric encryption techniques. **2.** Configure and evaluate basic network security mechanisms, including firewalls, Access Control Lists (ACLs), Intrusion Detection Systems (IDS), and Virtual Private Networks (VPNs). **3.** Identify and analyze common network security threats, including malware, phishing, and denial-of-service attacks, and explain appropriate prevention and mitigation techniques. **4.** Configure and assess wireless LANs and their security mechanisms, including WPA2/WPA3, and explain the security challenges associated with wireless communication. **5.** Describe and compare cellular network generations, mobile network architectures, Mobile IP, and Bluetooth communication technologies. **6.** Use network monitoring and diagnostic tools, including Wireshark, ping, traceroute, and SNMP-based tools, to analyze network traffic and troubleshoot connectivity problems. **7.** Explain and apply Quality of Service (QoS) concepts, bandwidth allocation, traffic shaping, and traffic prioritization to improve network performance. **8.** Measure and analyze network performance metrics, including latency, jitter, throughput, and packet loss, and evaluate network efficiency under different operating conditions. **9.** Design and evaluate network architectures for real-world scenarios, considering security, reliability, scalability, and performance requirements. **10.** Explain and investigate emerging networking technologies, including Software-Defined Networking (SDN), Network Functions Virtualization (NFV), and the Internet of Things (IoT), and discuss their applications in modern communication systems. **11.** Apply network configuration, security, monitoring, and troubleshooting techniques in simulation or virtual environments to implement and evaluate secure and efficient network systems. **12.** Evaluate current developments and future trends in networking and wireless communication technologies, considering their potential applications, benefits, and challenges.
Indicative Contents المحتويات الإرشادية	**1.** Fundamentals of Network Security: Basic security principles, confidentiality, integrity, availability, security policies, authentication, authorization, and access control mechanisms. **2.** Cryptography and Secure Communication: Cryptographic fundamentals, symmetric and asymmetric encryption, encryption and decryption processes, digital signatures, hashing, and key management. **3.** Firewalls and Intrusion Detection Systems: Firewall architectures and configurations, packet filtering, Access Control Lists (ACLs), Intrusion

	Detection Systems (IDS), Intrusion Prevention Systems (IPS), and network traffic filtering. **4.** Network Security Threats and Attacks: Common security threats, including malware, phishing, denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks, their characteristics, detection methods, and mitigation techniques. **5.** Virtual Private Networks (VPNs): VPN concepts, tunneling, remote-access and site-to-site VPN architectures, encryption for secure communication, and basic VPN configuration. **6.** Wireless Communication and Cellular Networks: Wireless communication fundamentals, cellular network generations (2G, 3G, 4G, and 5G), cellular network architectures, mobility management, and current developments in wireless communication. **7.** Wireless LAN Security and Mobile Communication: Wireless LAN architecture, IEEE 802.11 standards, WPA2/WPA3 security mechanisms, Mobile IP concepts, Bluetooth communication, pairing, and wireless security challenges. **8.** Network Monitoring and Diagnostic Tools: Network monitoring principles, Simple Network Management Protocol (SNMP), ping, traceroute, packet capture, traffic analysis, fault detection, and network troubleshooting. **9.** Quality of Service (QoS): QoS fundamentals, traffic classification, prioritization, scheduling, congestion management, and QoS mechanisms for voice, video, and data applications. **10.** Bandwidth Management and Network Performance: Bandwidth allocation, traffic shaping, traffic policing, latency, jitter, throughput, packet loss, performance measurement, and network optimization techniques. **11.** Network Design and Emerging Technologies: Real-world network design scenarios, network scalability and reliability, Software-Defined Networking (SDN), Network Functions Virtualization (NFV), and Internet of Things (IoT) architectures and applications. **12.** Future Trends in Networking and Integrated Network Design: Emerging developments in wired and wireless networking, advanced communication technologies, intelligent network management, security challenges, and the design, configuration, monitoring, and evaluation of secure and efficient network systems using simulation and analysis tools.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**1.** Lectures: Delivery of theoretical concepts related to network security, cryptography, wireless communication, network monitoring, Quality of Service (QoS), network performance, and emerging networking technologies through lectures and presentation slides. **2.** Practical Problem Solving: Worked examples and exercises involving encryption and decryption, firewall configuration, access control lists, bandwidth allocation, traffic shaping, and network performance metrics to develop students' analytical and problem-solving skills.

	3. Simulation-Based Learning: Hands-on implementation of networking and security concepts using simulation and virtual environments, such as Cisco Packet Tracer and Mininet, including wireless LAN configuration, VPNs, network traffic filtering, IoT networks, and SDN concepts. 4. Network Analysis and Troubleshooting: Practical use of network monitoring and diagnostic tools, such as Wireshark, ping, traceroute, and SNMP-based tools, to analyze packet flows, identify connectivity problems, and evaluate network performance. 5. Case Studies and Comparative Analysis: Examination of real-world scenarios involving network security threats, cryptographic techniques, wireless network security, cellular communication technologies, and emerging networking solutions. Students compare alternative approaches to security, network design, and performance optimization. 6. Project-Based Learning: Design and implementation of simulated network systems that integrate security mechanisms, wireless connectivity, monitoring tools, and performance management techniques. Students apply theoretical knowledge to practical network design and troubleshooting tasks. 7. Self-Study: Reviewing lecture materials, technical documentation, network configuration examples, security concepts, and simulation exercises. Students are encouraged to conduct independent research on emerging technologies, including SDN, NFV, IoT, and future trends in computer networking, to reinforce theoretical and practical learning.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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	Weeks 4 &11	MLO1–MLO4
	Assignments	2	10	Weeks 3 &7 &13	MLO1, MLO3, MLO5
	Projects / Lab.	2	10	Week 12	MLO1–MLO٦
	Report	1	10	Week 14	MLO6

Summative assessment	**Midterm Exam**	1	10	Week 8	MLO1–MLO4
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Cryptography (symmetric and asymmetric)**
Week 2	**Firewalls; Intrusion Detection Systems; VPNs**
Week 3	**Common security threats (malware, phishing, denial-of-service attacks)**
Week 4	**Cellular Networks (generations, architectures**
Week 5	**Wireless LAN security (WPA2/3)**
Week 6	**Mobile IP; Bluetooth**
Week 7	**Current trends in wireless communication**
Week 8	**Midterm Examination and Review: Assessment of the material covered in Weeks 1–7**
Week 9	**Network Monitoring tools (SNMP, ping, traceroute)**
Week 10	**QoS concepts**
Week 11	**Bandwidth allocation, traffic shaping**
Week 12	**Network performance metrics (latency, jitter, throughput)**
Week 13	**Network Access Control and Authentication**
Week 14	**Secure Web Communication and Digital Certificates: HTTPS, TLS/SSL**
Week 15	**Real-world network design scenarios, Emerging technologies (SDN, NFV, IoT), Future trends in networking**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Explore symmetric and asymmetric encryption concepts; demonstrate basic encryption and decryption using educational cryptography tools.**
Week 2	**Configure standard and extended ACLs; implement firewall rules in a simulated network; test permitted and denied traffic.**
Week 3	**Study malware, phishing, and denial-of-service threats; examine sample security alerts and demonstrate basic intrusion detection concepts using safe, preconfigured examples.**
Week 4	**Configure wireless access points and clients; implement WPA2/WPA3 where supported; test wireless connectivity and examine secure configuration practices.**

Week 5	**Study cellular network generations and architectures; examine mobile IP concepts; investigate Bluetooth communication and pairing using available devices or demonstrations.**
Week 6	**Explore VPN architecture and tunneling; configure a supported site-to-site VPN in a simulator or a controlled virtual environment; verify secure connectivity.**
Week 7	**Network configuration, security troubleshooting, wireless security analysis, and practical exercises.**
Week 8	**Use ping, traceroute, and Wireshark; examine SNMP concepts and network device status; identify connectivity problems and analyze packet captures.**
Week 9	**Configure and examine QoS policies where supported; classify traffic and investigate prioritization for voice, video, and data applications.**
Week 10	**Investigate bandwidth allocation and traffic shaping; measure latency, jitter, throughput, and packet loss using simulation or network measurement tools.**
Week 11	**Design a network for a real-world scenario; explore Software-Defined Networking (SDN), Network Functions Virtualization (NFV), and Internet of Things (IoT) concepts using suitable simulation tools.**
Week 12	**Design, configure, secure, monitor, and evaluate a simulated network; apply suitable security controls, monitoring tools, and performance analysis techniques; present the final project.**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Stallings, W. (2014). Network Security Essentials: Applications and Standards (5th ed.). Pearson	Yes
Recommended Texts	Donahue, G. A. (2011). *Network Warrior* (3rd ed.). O'Reilly Media.	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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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Satellite Communications**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE423**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		4	**Semester of Delivery**		8
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**		
Module Leader's Acad. Title		Assist. Prof.	**Module Leader's Qualification**		Ph.D.
Module Tutor	Assist. Prof. Dr. Hayder Miri Hamzah		**e-mail**	hayder.hamzah@qu.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to provide students with a comprehensive understanding of the principles, design, and analysis of satellite communication systems. It covers the fundamental orbital mechanics, the physics of the space link, and the engineering parameters necessary for successful signal transmission. The module aims to equip students with the skills to calculate link budgets, understand atmospheric impairments, and evaluate various multiple access techniques used in modern satellite networks.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the historical development, advantages, disadvantages, and various service types of satellite communication systems. 2. Compare and contrast different satellite orbits (GEO, MEO, LEO, Molniya, HAPs) regarding coverage, delay, and applications. 3. Calculate key link budget parameters including Free Space Loss (FSL), EIRP, Power Flux Density, and received power using decibel mathematics. 4. Analyze the effects of the atmosphere (rain, gaseous absorption, ionospheric effects) on signal propagation and determine necessary link margins. 5. Evaluate the performance of a satellite link by calculating the Carrier-to-Noise ratio (C/N_0), System Noise Temperature, and Figure of Merit (G/T). 6. Describe the principles of analog and digital modulation techniques (AM, FM, PAM, PWM) and Multiple Access techniques (FDMA, TDMA, CDMA, SDMA). 7. Identify the components of a satellite receiver system (LNA, Mixer, IF Amplifier) and assess their impact on overall system noise.
Indicative Contents المحتويات الإرشادية	1. Introduction to Satellite Systems**:** History (Arthur C. Clarke), Basic Architecture (Uplink/Downlink/Transponder), Advantages/Disadvantages, Service Types (FSS, BSS, MSS, GPS). 2. Satellite Orbits: Kepler's Laws (implied), Orbit Types (GEO, LEO, MEO, Molniya, HAPs), Coverage Angles, Elevation Angles, Footprints, and Propagation Delay comparisons. 3. The Space Link & Link Budgets: Free Space Attenuation, Inverse Square Law, Decibel Mathematics, EIRP, Power Flux Density, Received Power Calculations, Slant Range Distance. 4. Atmospheric Effects: Tropospheric effects (Rain, Gas absorption, Refractive bending), Ionospheric effects (Faraday rotation, Scintillation), Depolarization. 5. System Noise & Performance: Thermal Noise, Noise Temperature, Noise Figure, Cascaded Noise Calculations (Receiver Front End), Figure of Merit (G/T), Carrier-to-Noise Ratio (C/N_0). 6. Communication Techniques: Amplitude Modulation (AM, DSBSC, SSB), Frequency Modulation (FM, Narrowband/Wideband), Pulse Communication (PAM, PWM, PPM). 7. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA. Frequency planning, Guard bands, Interference.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Delivery of theoretical concepts, mathematical derivations, and system architectures (as presented in the slides). 2. Mathematical Problem Solving: Worked examples in class demonstrating link budget calculations (e.g., calculating EIRP, C/N_0 for GEO and LEO links). 3. Diagrammatic Analysis: Visual analysis of orbital mechanics, antenna radiation patterns, and system block diagrams. 4. Case Studies: Analysis of specific frequency bands (C, Ku, Ka) and their behavior under atmospheric conditions. 5. Self-Study: Reviewing provided formulas and attempting the "Example" slides to reinforce learning.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٥
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٣
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	Weeks 4 &11	MLO1–MLO4
	Assignments	2	20	Weeks 3 &7 &13	MLO1, MLO3, MLO5
	Projects / Lab.	N/A	N/A		N/A
	Report	1	10	Week 14	MLO6
Summative assessment	**Midterm Exam**	1	10	Week 8	MLO1–MLO4
	Final Exam	2 hr.	50% (50)	Final examination period	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	History (Arthur C. Clarke), Basic Communication Model (Uplink/Downlink), Transponders, Advantages vs. Terrestrial Systems.
Week 2	Service Types (FSS, BSS, MSS, GPS), Frequency Bands (C, Ku, Ka), Introduction to Atmospheric Attenuation.
Week 3	Geostationary Orbit (GEO), Altitude (36,000 km), Coverage, Advantages (24h view), Disadvantages (Delay, Polar coverage).
Week 4	Low Earth Orbit (LEO) characteristics, Doppler shift, Atmospheric drag, MEO characteristics, Comparison with GEO/LEO.
Week 5	Molniya Orbit (Elliptical), High Altitude Platforms (HAPs), Remote Sensing applications.
Week 6	Free Space Attenuation, Inverse Square Law, Decibel Conversion, Power Balance Equations.
Week 7	Slant Range Distance, Elevation Angles, Atmospheric Effects (Tropospheric absorption, Rain, Ionospheric effects).
Week 8	QoS, BER, Eb/N0, Carrier-to-Noise Ratio (C/N_0), Configuration of a Link (Tx/Rx components).
Week 9	Antenna Gain, Effective Aperture, Radiation Patterns, 3dB Beamwidth, Polarization (Linear/Circular).
Week 10	EIRP, Power Flux Density, Free Space Loss (LFS), Received Power Calculations, Example problems.
Week 11	Feeder Losses, Depointing Losses, Polarization Mismatch, Atmospheric Losses. Introduction to System Noise, Thermal Noise, Noise Figure.
Week 12	Active/Passive Device Noise, Receiver Antenna Noise, Cascaded System Noise Temperature, Figure of Merit (G/T).
Week 13	Calculation of C/N_0 for Uplink and Downlink scenarios. Full link budget walkthroughs.
Week 14	Amplitude Modulation (AM, DSBSC, SSB), Frequency Modulation (FM), Pulse Communication Systems (PAM, PWM).
Week 15	FDMA, TDMA, CDMA, SDMA. Frequency planning and guard bands. Course review and exam preparation.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Satellite Communication	Yes
Recommended Texts	Satellite Communication Systems	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	**Wireless and Mobile Communications**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE424				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Electronics and Communications Engineering		**College**	College of Engineering	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Students will understand the principles of propagation and the characteristics of electromagnetic waves used in wireless communications. 2. Students will demonstrate the ability to identify the types of wireless communication systems, such as cellular networks, wireless local area networks, and satellite systems. 3. Students will understand the concept of cellular networks, how they work, and their main components. 4. Students will understand the concepts of network traffic and how to plan and manage wireless network capacity (traffic engineering). 5. Students will understand the principles of wireless signal propagation and the impact of path loss and multipath propagation on network performance. 6. Students will understand the multiple access technologies (FDMA, TDMA, CDMA) and demonstrate the ability to compare them. 7. Students will recognize modern wireless systems, including fourth and fifth generation (4G/5G) cellular networks, wireless local area networks, and satellite communications systems. 8. Students will understand the working principles and applications of WiFi, Bluetooth, and ZigBee technologies.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognizing the basic concepts of wireless communications, the properties of electromagnetic waves, and the types and applications of wireless systems. 2. Understanding the cellular concept: covering wide geographical areas, network components, and handoff between cells. 3. Analysis of traffic in wireless networks and planning of network capacity. 4. Understanding wireless signal propagation: path loss, multipath propagation, and techniques to mitigate their effects. 5. Comparison of multiple access techniques (FDMA, TDMA, CDMA, OFDMA) and selection of the appropriate technique for a specific application. 6. Recognizing modern wireless systems: 4G and 5G cellular networks, WLAN, and satellite communications. 7. Explaining the working principles of WiFi, Bluetooth, and ZigBee and determining the appropriate applications for each.
Indicative Contents المحتويات الإرشادية	Introduction to wireless communication systems: concept, development, types, and applications. Cellular network concept and design: cell design and frequency distribution, network components, handoff. Traffic engineering in wireless networks: traffic concepts, traffic models and analysis, capacity planning and management. Path loss: definition, models, and effect on network performance. Small-scale multipath propagation and mitigation techniques. Multiple access technologies: FDMA, TDMA, CDMA, comparison and applications. Modern wireless systems: 4G and 5G cellular networks, WLAN, satellite communications systems. WiFi, Bluetooth, ZigBee: working principles and applications. Course review.

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 lectures, interactive tutorials, practical exercises, and a practical project. In this direct learning method, students work their way through a problem to find a solution. Along the way, they must develop the knowledge to understand the problem and use creative thinking to solve it.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	80	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.3
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)	4, 11	LO # 1, 2, 4 and 5
	Assignments	2	10% (10)	6, 12	LO # 3, 4 and 5
	Practical Project	1	10% (10)	13	LO # 5, 6 and 7
Summative assessment	**Test 1 (First half test)**	1 hr	10% (10)	8	LO # 1-4
	Test 2 (Second semester test)	1 hr	10% (10)	14	LO # 4-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to wireless communication systems: the concept of wireless communications and its development, types of wireless communication systems, wireless communications applications.
Week 2	Cellular network concept and design: principles of cellular networks, cell design and frequency distribution.
Week 3	Cellular network concept and design (cont.): components of cellular networks, handoff between cells.
Week 4	Traffic engineering in wireless networks: concepts of traffic in networks, traffic models and analysis.
Week 5	Traffic engineering in wireless networks (cont.): network capacity planning and management.
Week 6	Path loss: definition of path loss, path loss models and their analysis.
Week 7	Path loss (cont.): the effect of path loss on network performance.
Week 8	Test 1 (First half test)
Week 9	Small-scale multipath propagation: the concept of multipath propagation, its effect on the communications signal, techniques to mitigate its impact.
Week 10	Multiple access technologies: FDMA, TDMA, CDMA.
Week 11	Multiple access technologies (cont.): comparison of multiple access technologies, applications of multiple access techniques in wireless networks.
Week 12	Modern wireless systems: fourth generation (4G) and fifth generation (5G) cellular networks, wireless local area networks (WLAN), satellite communications systems.
Week 13	WiFi, Bluetooth, ZigBee: working principles and applications.
Week 14	Test 2 (Second semester test)
Week 15	Course review
Week 16	**Preparatory week before the final exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Theodore S. Rappaport, Wireless Communications: Principles and Practice.	
Recommended Texts	William C. Y. Lee, Mobile Cellular Telecommunications: Analog and Digital Systems.	
Websites	http://www.qu.edu.iq (the official university website; the subject page can be reached from there or through the college website).	

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	**Control systems 2**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE425**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		4	**Semester of Delivery**		8
Administering Department		ECE	**College**	Engineering	
Module Leader	Muhanad Dheya Hashim		**e-mail**	muhanad.almawlawe@qu.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	None		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/06/2025	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE 411 control systems ,ENG 211 –mathematics III, ECE 225 Electronics II.	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1-Identify how to analyze frequency response. 2-Identify how to draw a Bode plot for amplitude and phase. 3-Identify polar plot and Nyquist plot methods to determine stability. 4-Identify M and N circle and Nichol chart. 5-Identify Lead & lag compensator 6-Identify digital control circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Introduction to frequency analysis. 2-Bode plot (gain and phase) 3-Polar plot, Nyquist plot. 4-Stability analysis: Routh- Hurwitz Criterion, Root-locus technique, Dominant poles, Root locus diagram, Nyquist stability Criterion. 5-Compensators (lead, lag, lead-lag). 6-Discrete- time control System.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will focus on encouraging active student participation in exercises to refine and expand their critical thinking skills. The module will utilize classes, interactive tutorials, and simple experiments involving sampling activities to engage and interest students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to frequency analysis
Week 2	Bode diagram
Week 3	Polar plot
Week 4	Nyquist plot
Week 5	Nichol diagram
Week 6	Lag compensators

Week 7	Lead Compensators
Week 8	Mid. exam
Week 9	Stability analysis: Routh- Hurwitz Criterion
Week 10	Root-locus technique
Week 11	Dominant pole
Week 12	Controller, types
Week 13	PID controllers, calculations
Week 14	PID controllers, calculations 2
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Mathlab.
Week 2	Lab 1: Control systems types.
Week 3	Lab 1: Introduction to Simulink.
Week 4	Lab 2: Laplace and inverse Laplace using Mathlab
Week 5	Lab 2: How to represent transfer function in Nathlab.
Week 6	Mid-term Exam
Week 7	Lab 3: How to find steady state error using Mathlab.
Week 8	Lab 4: How to find Bode Plot in Mathlab.
Week 9	Lab 4: How to find polar& Nyquist plot in Mathlab.
Week 10	Lab 5: How to find Nichol diagram using Mathlab.
Week 11	Lab 5: How to find compensators using MAthlab.
Week 12	Lab 6: How to find root locus using Matghlab.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Katsuhiko Ogata, "Modern Control Engineering ", Fifth Edition.	Yes

Recommended Texts	Norman, Nise, “Control System Engineering”, Sixth edition, John Wiley & Sons. Inc.	No
Websites	https://www.tutorialspoint.com/control_systems/control_systems_mathematical_models.htm	

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	**Digital Signal Processing 2**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE427				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		4	**Semester of Delivery**		8
Administering Department		Electronics and Communications Engineering	**College**	College of Engineering	
Module Leader	Dr. Yousif Mohsin Hasan		**e-mail**	yousif.hasan@qu.edu.iq	
Module Leader's Acad. Title		Assis. Professor	**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		18/10/2024	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Digital Signal Processing 1	**Semester**	7
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Apply the principles of Z-transforms to finite difference equations. 2. Apply the principles of Fourier transform analysis to describe the frequency characteristics of discrete-time signals and systems. 3. Apply the principles of Fourier Series of Discrete -Time Periodic Signals (DTFS). 4. Apply the principles of Discrete -Time Fourier Transform (DTFT) for Periodic Signals. 5. Apply the principles of Discrete Fourier Transform (DFT), Frequency Domain and Sampling and Reconstruction of Discrete -Time Signals. 6. Apply the principles of signal analysis to filtering. 7. Use computer programming tools to process and visualize signals.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Ability to apply current knowledge and applications of mathematics, science, engineering and technology 2. Ability to creatively design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. 3. Ability to identify, formulate, analyze and solve technical and engineering problems 4. Ability to use the techniques, skills and modern technical tools necessary for technical or engineering practice.
Indicative Contents المحتويات الإرشادية	The z-transform, inversion of z-transform methods, Analysis of LTI System by z-transform. Discrete-Time Fourier Series (DTFS), Discrete-Time Fourier Transform (DTFT): relations, properties and convergence. Frequency-Domain Analysis of LTI Systems: Response to complex and sinusoidal signals, The frequency response function and geometric interpretation of poles and zeros. The Discrete Fourier Transform (DFT): Its properties and applications, The DFT as a linear transformation, circular convolution theorem, and the use of the DFT in linear filtering.

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 and interactive tutorials. In this direct learning method, students work their way through a problem to find a solution. Along the way, they must develop the knowledge to understand the problem and use creative thinking to solve it.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	77	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**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, 10	LO #1, 2, 8 and 9
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	The Z-Transform
Week 2	Inversion Method of Z-Transform
Week 3	Solution of Difference Equations
Week 4	Analysis of LTI system in Z-Transform
Week 5	The Fourier Series of Discrete -Time Periodic Signals (DTFS), Power Density Spectrum of Periodic Signals.
Week 6	The Fourier Series of Discrete -Time Periodic Signals (DTFS), Power Density Spectrum of Periodic Signals.
Week 7	Mid-term Exam
Week 8	The Discrete -Time Fourier Transform (DTFT) for Periodic Signals and its Convergence, Energy Density Spectrum of Periodic Signals.
Week 9	Relationship of DTFT to Z-Transform, Theorems and Properties of DTFT, Symmetry Properties.
Week 10	Frequency Domain Analysis of LTI Systems, Response to Complex exponential and Sinusoidal Signals, Steady-State and Transient Response, Response to a periodic Input Signals.
Week 11	Frequency Domain Analysis of LTI Systems, Response to Complex exponential and Sinusoidal Signals, Steady-State and Transient Response, Response to a periodic Input Signals.
Week 12	Frequency Response of LTI Systems, Computation of the Frequency Response Functions & Geometric Interpretation of Poles and Zeros,
Week 13	The Discrete Fourier Transform (DFT), Frequency Domain and Sampling and Reconstruction of Discrete -Time Signals.
Week 14	The DFT as a Linear Transformation, Relationship of DFT to other Transforms(DFS, Z-Transform, and CTFS)
Week 15	Properties of DFT, Circular Convolution. Multiplication of Two DFTs and Circular Convolution, Use of the DFT in Linear Filtering.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Develop a program for computing z-transform and inverse Z-transform of a transfer function in MATLAB. Part1
Week 2	Develop a program for computing z-transform and inverse Z-transform of a transfer function in MATLAB. Part2
Week 3	Draw pole zero diagram for a function in z domain & display the frequency response of given z-transform.
Week 4	Frequency response of a system from its z-transform using MATLAB
Week 5	Cascade and Parallel operations of systems using z transform in MATLAB
Week 6	Frequency Analysis of Discrete Time Signals using MATLAB
Week 7	Computing Discrete Time Fourier Series in MATLAB
Week 8	Computing Discrete Time Fourier Transform in MATLAB
Week 9	Mid-term Exam
Week 10	Computing Discrete Fourier Transform in MATLAB
Week 11	Computing circular shift and circular convolution in MATLAB
Week 12	Plot the magnitude and phase of the frequency response of the given digital filter using freqz function.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	J. G. Proakis and D. G. Manolakis Digital Signal Processing: Principles, Algorithms, and Applications, 3rd Edition	No
Recommended Texts	Digital Signal Processing System Analysis and Design, Second Edition Paulo S. R. Diniz, Eduardo A. B. da Silva, and Sergio L. Netto Discrete-time Signal Processing, 3rd Edition A. Oppenheim and R. Shaffer	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.