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

AL- Muthanna University
College of Engineering
Department of electronic and communications engineering

BSc. in Electronic and Communications Engineering program

Course Description Forms

Modules Description for Electronics and Communication Engineering

1. Undergraduate Courses 2023-2024

Module: 1			
Code	**Course/Module Title**	**ECTS**	**Semester**
ENG001	Mathematic I	5	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	63
Description			
The study of numbers, equations, functions, and geometric shapes (see geometry) and their relationships. Some branches of mathematics are characterized by use of strict proofs based on axioms. Some of its major subdivisions are arithmetic, algebra, geometry, and calculus. Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of mathematics, 2) an ability to conduct the main concepts of Applications of Derivatives , 3) the ability to develop the functions & rational functions 4) Analyze Graph the Function, 5)Limit and Continuous. 6) an of Trigonometric functions, 7) an ability to understanding Methods of Integration, 8) an education necessary to understand the impact of Applications of Definite Integrals, and 9) an ability to use the techniques, skills, and modern engineering tools necessary for Matrix.			

Module :2			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE112	Electrical circuits I	8	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	4	107	93
Description			
This module introduces students to the fundamental principles of electronics, and how to design, build and test simple analogue and digital circuits. This module introductory course to the fundamentals and basic principles of DC circuits. Topics include: resistance, voltage, current, Ohm's Law, Kirchhoff's Laws, power, superposition, network theorems, Thevenin's and Norton's Theorems, maximum power transfer,. Laboratory hours complement class work			

Module : 3			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE113	Electronic Physics	6	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3		47	103
Description			
This course provides a background on the Mechanical, Electrical & thermal properties. This includes the Chemical and Magnetic properties and atomic Thomson model of the atom, Rutherford Model of the Atom. Moreover, topics of Wave nature of Light, Dual nature of Light, Probability and wave Function are given in this course. Electronic physics contains the analyze of the One dimension Electronic Wave, Two dimension and Three dimension Electronic Wave as well as Wave Function and the four quantum number. Furthermore, this course provides background of Pauli principle and quantization of energy and the Electronic charge distribution as well as Bounding , Hydrogen molecule, Ionic bound, covalent bound.			

Module: 4			
Code	**Course/Module Title**	**ECTS**	**Semester**
ENG003	Engineering Drawing	4	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
1	3	62	38
Description			
This course was designed in a way that you learn Engineering Drawing is that engineering activity is concerned with the exportation of conducting methods and it is applications on a commercial scale. The objectives are to introduce the students to use drawing instruments and to draw various types of line and engineering methods such as divided the lines, the curves, and draw polygon, and etc. However, the basics to build the concepts for image the orthographic projection, shapes, and plans. Also, the students have ability to make drawing in 3D view through isometric with different positions inclined to one of the plans. In additional to support the engineering drawing idea by using computer aided design software to creating drafting symbols, lines and figure (circle, rectangular, and etc.) modify objects on figures.			

Module : 5			
Code	**Course/Module Title**	**ECTS**	**Semester**
UNI004	**Computers** I	4	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
1	2	48	52
Description			
For hardware, a module is an assembly of parts designed to be added and removed from a larger system easily. An example of a hardware module is a stick of RAM. Most modules are not functional on their own. They need to be connected to a larger system or be part of a system made up of several modules. The concept of modularity or being made up of modules is common in computer hardware. A modular system has many advantages allowing for ease of repair, upgrade and extension of functionality. The various modules can be swapped out as needed. Standardization of hardware as interconnects enables several vendors to produce modules creating better choice for consumers.			

Module 6			
Code	**Course/Module Title**	**ECTS**	**Semester**
UNI003	Arabic Language	3	1
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2		31	44
Description			
تعد اللغة العربية هوية للناطقين بها، ورابط يوحدهم ويميزهم من سائر شعوب العالم، فلذلك يسعى المقرر إلى خدمة هذه اللغة واالعتناء بها ونشر قواعدها، لتبقى حية فيما تنطق به األلسنة، وما تسطر به األلقالم، ولتظل وعاء النحو: يهدف هذا :للفكر والعلم يصان ويعتنى به على مر العصور. يشمل هذا المقرر تغطية مفاهيم اللغة العربية المقرر لضبط قواعد التركيب الخاص بالجملة؛ وذلك بدراسة قواعد اللغة العربية، وهي أقسام الكالم ودراسة القضايا المشتركة بين تلك األلقسام ثم يبدأ ببعض قضايا االسم والفعل والحرف والمعرب والمبني، والنكرة والمعرفة، ومرفوعات األلسماء ومنها المبتدأ والخبر، والفاعل، ونائب الفاعل، وبعض مواضيع منصوبات الصرف: ويهدف إلى دراسة القضايا المتعلقة بالكلمة وما يطرأ .أللسماء، ويعنى في كل ذلك بالتدريبات المناسبة .عليها من تغيير، فيدرس مباحث الفعل وتقسيماته، الصحيح، والمعتل، ويعنى في كل ذلك بالتدريبات المناسبة إلمالء والتعبير: ويهدف إلى دراسة القضايا التي تواجه المتعلم أثناء الكتابة، فضالً عن اهتمامه بتنظيم الكتابة التناسق محققا واالنسجام بين أجزاء الكالم والجمل وذلك من أجل الكتابة الصحيحة والتعبير السليم وتقويم لسانً التاء المربوطة والمفتوحة، فضالً المتعلم؛ فهو يدرس موضوع الفرق بين الضاد والظاء، وقواعد كتابة عن األلدب: .قواعد كتابة همزة الوصل والقطع، وعالمات الترقيم والتنقيط ويعنى في كل ذلك بالتدريبات المناسبة .ويهدف إلى تنمية ذوق الطالب األلدبي وإثراء تحصيله وإغناء زاده من الفكر العربي واإلسالمي			

Module : 7			
Code	**Course/Module Title**	**ECTS**	**Semester**
ENG005	Mathematic II	5	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	63
Description			
To reach the general course goals, specific objectives were developed for each section of material that describe the concepts that I consider most critical for you to take from this course: Identify the mechanisms of Composite numbers simultaneously in practice, and develop an awareness of Trigonometric functions with Hyperbolic functions, and solve various mathematic problems encountered in practice Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of mathematics, 2) an ability to conduct the main concepts of Applications of Derivatives , 3) the ability to develop owe functions & rational functions 4) Analyze Graph the Function, 5)Limit and Continuous. 6) an of Trigonometric functions, 7) an ability to understanding Methods of Integration, 8) an education necessary to understand the impact of Applications of Definite Integrals, and 9) an ability to use the techniques, skills, and modern engineering tools necessary for Matrix.			

Module :8			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE122	Electrical circuits II	8	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	4	107	93
Description			
This course is designed to provide a complete overview of AC electric circuit analysis used in electrical engineering and electronics engineering. In this course you will learn everything about AC electric circuits and electronics, from the basics such as what sinusoids are, all the way to key characteristics of AC circuits such as impedance, admittance, power factor, and complex power. Laboratory hours complement class work			

Module : 9			
Code	**Course/Module Title**	**ECTS**	**Semester**
UNI006	Human Rights & Democracy	3	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	-	31	44
Description			
تضمن هذا المنهاج تعريف شامل ومركز بحقوق الإنسان ابتداء من جذور نشأتها والتطورات التي شهدتها هذه الحقوق الإنسانية عبر العصور والمجتمعات البشرية وإسهام الشرائع السماوية والأديان والحضارات في رفدها بالقيم والمثل مرورا بمختلف العصور. كذلك يشمل تفعيل العقل والتفكير والإبداع والحرص على المشاركة الديمقراطية بكل تفاصيلها ومبادئ العدالة الاجتماعية.			

Module : 10			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE124	Electronic Materials	6	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	88
Description			
This course provides a background on the Energy bound Theory in Crystals. This includes the understanding of the Conductors, Semiconductor and insulator, Fermi level, the electrical conduction. Moreover, topics of the metallic crystal under magnetic field , the resistance, temperature, and super conductivity are given in this course. Electronic materials contains a detailed background on semiconductors, The crystal structure representative as well as the intrinsic semiconductor and intrinsic conductors. Furthermore, this course provides background of P-N junction, diode equation and biasing and the junction transistors.			

Module : 11			
Code	**Course/Module Title**	**ECTS**	**Semester**
UNI001	Technical English Language I	4	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	-	32	68
Description			
This course provides an introduction to improve the student's ability to communicate and their linguistic competence in English language. In this course the beginner level would be sufficient for very simple interactions, for example as a basic greeting, description of the city, and their appearance and personalities. Also talk about the daily activities and arrange meetings with friends and colleagues. Describe current weather conditions and suggest common actives according to the weather forecast. Although progress of their ability will depend on the type of course to reach the level A1 in English skills.			

Module : 12			
Code	**Course/Module Title**	**ECTS**	**Semester**
ENG002	Workshop Technology	4	2
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
-	3	47	53
Description			
Workshop is the core of learning about different Materials, equipment, tools and manufacturing practices that are observed in different manufacturing functions and operations. Workshop is also of prime importance when you want to gather about the practical knowledge. What is the role of an engineer in workshop? Overview Take complete responsibility for specific workshop jobs. Main activities will be dismantling, cleaning, inspecting, repairing, assembling and testing diesel engines spares and assemblies. Will need a “hands-on” approach to other mechanical engineering projects. What is the importance of learning workshop basics for an engineer? The workshop experiences would help to build the understanding of the complexity of the industrial job, along with time and skills requirements of the job. Workshop curricula build the hands on experiences which would help to learn manufacturing processes and production technology courses in successive semesters. What are the types of engineering workshop? The Engineering Workshops consist of the Machine Shop (metal work), the Fitting Shop, the Foundry, the Smithy, the Welding shop, the Carpentry Shop and the Motor Vehicle Repair Unit and Service Facility.			

Module 13			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE211	Mathematic III	5	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	63
Description			
Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of Laplace transformer, 2) an ability to conduct the main concepts of Gamma functions , Bessel's equations , Legendre equation 3) the ability to develop ower Z transform : direct Z transform , invers Z transform 4) Analyze vector, 5)Second order differential equations: undetermined coefficients, variation of parameters . 6) an of Triple integral : in Cartesian coordination , cylindrical , spherical coordination , 7) an ability to understanding Fourier series, 8) an education necessary to understand the impact of inverse of Fourier transform, and 9) an ability to use Exponential form of Fourier series, engineering applications.			

Module 14			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE212	Electronics I	8	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	106
Description			
This Course is for Students having background in analog Electronics and basic of semiconductor or any relevant stream. This Course is also called as Analog Circuits have an experience in any Circuit Design Course based on a Theoretical and Analytical of the semiconductors (diode , transistor). This Course is exclusively made from Beginners point of introduction to electronic and push the student to learn building Circuits Design Sense. This course will focus on different topics with this Course like Operational Amplifiers, Diodes, **Transistors based on the Dc power supply.** Also this section will able to handle any Problem in Analog Circuits after finishing this Course . *This is a basic Analog Electronics Course. This course covers all basic concepts related to P-N Junction Diode, Special purpose diodes, Bipolar Junction Transistor and Field Effect Transistor .The complete course is divided into three sections. Section-1 covers basic concepts of P-N junction diode, special purpose diodes-Zener Diode, LED, Photodiode and Diode applications-Rectifiers, Clipping Circuits & Clamping Circuits. Section-2 covers concepts of Bipolar junction Transistor including construction, working and Input-Output Characteristics of BJT*			

Module 15			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE213	Network Analysis I	3	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	0	32	43

Description

This course provides a comprehensive introduction to electrical Network analysis and energy storage elements. Students will learn about the fundamental principles and characteristics of inductance, capacitance, and mutual inductance. The course covers various topics, including series-parallel combinations of energy storage elements and their applications in circuit analysis.

The course begins with an exploration of energy storage elements, focusing on inductance, capacitance, and mutual inductance. Students will gain an understanding of their properties, behavior, and applications in electrical circuits. The series and parallel combinations of energy storage elements will be coverd. Students will learn how to solve and analyze the circuits that involve Natural and Step Response of First-Order RL and RC Circuits. They will explore the time constant, general solution, and transient behavior of these circuits under different initial conditions. Sequential Switching will be covered also and learn how to analyze circuits that involve the switching on and off of energy storage elements.

The course covers the natural and step responses of second-order series and parallel RLC (resistor-inductor-capacitor) circuits. Students will explore the behavior of these circuits under different damping conditions, including underdamped, critically damped, and overdamped responses. Students will learn the general solution techniques for second-order RLC circuits.

Module 16			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE214	Electromagnetic fields I	5	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	63

Description

Electromagnetics provides the mathematical description of all electrical phenomena, and therefore it is the physical foundation of all Electrical and Computer Engineering disciplines. Modern applications of electromagnetics are broad and include wireless communication systems, global navigation systems, bioelectrical phenomena, high speed computers and computer networks, and electromagnetic phenomena in Earth's near-space environment (space weather) as well as electrical, optical, and photonic devices. This course provides instruction in the fundamental engineering science and also the basics of modern applications. This course builds on the mathematics concepts learned in EC 212.

Module 17

Code	Course/Module Title	ECTS	Semester
ECE215	Digital Electronics I	5	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	64	61

Description

This course provides an introduction to the fundamentals of combinational logic, Boolean algebra, digital arithmetic, sequential logic, and microprocessor instruction set architecture and I/O for the second year students. Learning opportunities include: lectures with integrated practice exercises; tutorials in which small teams work together to explore, discuss, analysis and explain digital electronic circuits; and practical's in which theory is put to useful application. The course is designed to be one of the first undertaken by new students in electronic and communication engineering, such that its successful completion will provide the necessary foundation for more specialist is learning in digital microelectronics and computer engineering.

Module: 18

Code	Course/Module Title	ECTS	Semester
UNI005	Computers II	4	3
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	64	36

Description

This is a fast-paced introductory course to the C++ programming language. It is intended for those with little programming background, though prior programming experience will make it easier, and those with previous experience will still learn C++-specific constructs and concepts.

By the end of this course, you should be able to:

- Understand and use the basic programming constructs of C/C++
- Manipulate various C/C++ datatypes, such as arrays, strings, and pointers
- Isolate and fix common errors in C++ programs
- Use memory appropriately, including proper allocation/deallocation procedures
- Write small-scale C++ programs using the above skills

Module 20			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE221	Mathematic IV	5	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	63
Description			
This course was designed in a way such that you learn that mathematics is that engineering activity concerned with the exploitation of conducting methods and it is applications on a commercial scale. Its goal is the successful to present the basic of Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to mathematic: 1) an ability to apply knowledge of Laplace transformer, 2) an ability to conduct the main concepts of Gamma functions , Bessel's equations , Legendre equation 3) the ability to develop owe Z transform : direct Z transform , invers Z transform 4) Analyze vector, 5)Second order differential equations: undetermined coefficients, Variation of parameters . 6) an of Triple integral : in Cartesian coordination , cylindrical , spherical coordination , 7) an ability to understanding Fourier series, 8) an education necessary to understand the impact of inverse of Fourier transform, and 9) an ability to use Exponential form of Fourier series, engineering applications.			

Module 21			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE222	Electronics II	7	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	81
Description			
This course on Analog Electronic Circuits has been designed primarily as a core course for undergraduate students. It starts with basic circuit components and circuit concepts and then, gradually moves to practical building blocks of analog electronic systems. This course will focus on different topics with this Course like Operational Amplifiers, Diodes, **Transistors based on the AC power supply. Inthis s**ection covers introduction to Multistage Amplifiers (Block Diagram, Gain Calculation, Gain in Decibels , Different types of Coupling arrangements : R-C Coupling, Transformer Coupling, Direct Coupling, Advantages & Disadvantages of Coupling, Comparison			

between Coupling Schemes, R-C Coupled Amplifier, AC & DC Equivalent Circuit of R-C Coupled Amplifier), Distortions in Amplifiers, Feedback Amplifiers, Oscillators and Power Amplifiers. Also , this section will focus on introduction to Differential Amplifiers, Operational Amplifiers, internal structure of an Operational- Amplifier, Characteristics of an ideal Operational Amplifier, Non idealities in an Operational Amplifier (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product), and frequency response with different classes of the operation amplifier.

Module 22

Code	Course/Module Title	ECTS	Semester
ECE223	Network Analysis II	4	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	1	47	53

Description

This course provides a comprehensive introduction to the Laplace Transform and its applications in Electrical Network Analysis. Students will develop a solid understanding of the Laplace Transform, its properties, and its use in solving differential equations that arise in electrical circuits. The course covers a range of topics, including transfer functions, steady-state sinusoidal response, convolution integral, and frequency-selective circuits.

Students will learn the basics of the Laplace Transform, including its definition, properties, and advantages over traditional time-domain analysis. They will understand the concept of transforming time-domain signals into the frequency domain using complex algebra. The course covers the step function and impulse function, their mathematical definitions, and their significance to represent different types of inputs and disturbances in electrical circuits. The concept of poles and zeros of the Laplace Transform will be covered and understanding how these complex values influence the behavior and stability of electrical systems.

The course emphasizes the use of Laplace Transforms in analyzing electrical circuits. Students will learn how to decompose complex transfer functions into simpler fractions and use convolution to analyze the response of linear time-invariant (LTI) systems to arbitrary inputs. Steady-State Sinusoidal Response and Frequency Selective Circuits will be explored in this course. Students will learn about the characteristics and analysis of filters, such as low-pass, high-pass, bandpass, and band-stop filters, using Laplace Transforms and transfer functions.

Module 23			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE224	Electromagnetic fields II	5	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3		47	78
Description			
This course examines electric and magnetic quasistatic forms of Maxwell's equations applied to the dielectric, conduction, and magnetization boundary value problems. Topics covered include: electromagnetic forces, force densities, and stress tensors, including magnetization and polarization; thermodynamics of electromagnetic fields, equations of motion, and energy conservation; applications to synchronous, induction, and commutator machines; sensors and transducers; microelectromechanical systems; propagation and stability of electromechanical waves; and charge transport phenomena. This course builds on the fundamental EM field concepts learned in EC 214.			

Module 24			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE225	Digital Electronics II	5	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	64	61
Description			
This course provides an introduction to the fundamentals of sequential circuits with two types; the synchronous and asynchronous, counters, This course provides an introduction to flip flops, latches, applications of flip flops (counters and shift registers) and the memory and storage device for the second year students who had previous knowledge in combinational circuits. (Prerequisite: EE- 215). Learning opportunities include: lectures with integrated practice exercises; tutorials in which small teams work together to explore, discuss, analysis and explain digital electronic circuits; and practical's in which theory is put to useful application. The course is designed to be one of the first undertaken by new students in electronic and communication engineering, such that its successful completion will provide the necessary foundation for more specialist is learning in digital microelectronics and computer engineering.			

Module 25			
Code	**Course/Module Title**	**ECTS**	**Semester**
UNI002	Technical English Language II	4	4
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	-	32	68
Description			
This course provides to enable students to improve both their ability to communicate and competence in English language. They can understand the main points of clear texts on the daily familiar topics in standard language. Also, explore the international culture and history, engage in dialogue on topics of relevant interest to tutors, and gain confidence in reading, writing, and speaking the English language. The main idea of this course is to improve their vocabulary, grammar, pronunciation, and conversation skills. The main focusing is reading paragraphs and articles, identify the various forms and types of articles, explain the diverse text and strategies employed by reader which being base on the next level of English Learning.			

Module: 26			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE311	Communication Systems I	8	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	106
Description			
The Communication Systems module provides you with a detailed understanding of how communication systems work, from theoretical concepts through to the design of practical communication systems. Topics include: Signal models, energy and power signals. The Fourier Series and its properties, forms, table, and line spectra. The Parseval's power theorem. The Fourier Transforms including properties, theorems, pairs, and Fourier Transforms of periodic signals. The power spectral density, correlation functions of energy signals, correlation functions and autocorrelation of power signals, and Rayleigh's energy theorem. The LTI systems, linear distortion, ideal filters, and practical filters. The amplitude modulation including DSB modulation, Conventional AM, SSB modulation, Hilbert Transform, the superheterodyne receiver, interference, and noise. The angle modulation, phase, and frequency modulation, spectrum of an angle-modulated signal, Carson's Rule, direct EM generation, indirect FM generation, and demodulation of angle modulated signals. The multiplexing techniques, frequency division multiplexing, stereophonic FM broadcasting, and quadrature multiplexing.			

Module: 27			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE312	Energy Conversion	4	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	-	47	53
Description			
This course provides a comprehensive understanding of energy conversion processes and their application in renewable energy systems. Students will explore various topics, including magnetic circuits, transformer principles, types of DC machines, AC machines, controlled switches, diode rectifiers, DC-DC converters, DC-AC inverters, and renewable energy sources such as solar and wind power. The course emphasizes the principles, operations, and circuits associated with energy conversion and the integration of renewable energy sources. They course includes the behavior of magnetic materials, magnetic flux, and magnetic circuits in the context of transformers and electrical machines. The course will be provides different types of DC machines, such as DC generators and DC motors, and also explore various types of AC machines, including synchronous machines and induction machines. Students will learn about different types of controlled switches used in power electronics. The study of the rectification, half-wave and full-wave rectifiers, will be covered. DC-DC and DC-AC Converters will be explored with their applications in power electronics. Students will explore the operation and circuits associated with renewable energy systems. They will study the integration of solar panels, wind turbines, inverters.			

Module : 28			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE313	**Electronic III**	6	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	88
Description			
This course provides a background the JFET transistors including the construction and biasing. This includes the understanding of the construction and physical properties of the depletion-mode MOSFET transistors and Enhancement mode MOSFET transistors. Moreover, topics of the biasing networks of MOSFET circuits including the fixed-bias configuration and self-bias configuration are given in this course. Electronic materials contains Design the single stage amplifiers including the common source amplifiers, source followers, and common gate amplifiers as well as the differential amplifiers and the Op-Amp basics and specifications. Furthermore, this course provides the Analysis of the high frequency response in MOSFET amplifiers.			

Module 29			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE314	Wave propagation	3	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	0	32	43
Description			
This is an important senior level course for students in the electromagnetics and communications area. Greater demand for flexibility and portability has led to a boom in the cellular-radio telephone industry, and recent research efforts by leading telecommunications firms indicate that radio links may replace wires in offices and factories of the future, becoming the more conventional offices and factories of the future. More conventional types of radio communication are used extensively by military and consumer industries throughout the RF spectrum. This course presents fundamental concepts for understanding, evaluating, and predicting radio propagation effects throughout the radio spectrum and in a variety of scenarios. Students planning careers in radar, communication systems, or electromagnetics are introduced to fundamental concepts which govern radio wave propagation. This course illustrates how electromagnetic field theory can be applied to the development of practical design tools such as link budgets. This course builds on the fundamental EM field concepts learned in EC 224.			

Module 30			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE315	Microprocessors	5	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	3	79	46
Description			
This course provides an introduction to the basic computer organization and introductory microprocessor architecture. Introduction to assembly language programming: basic instructions, program segments, registers, and memory. Control transfer instructions; arithmetic, logic instructions; rotate instructions and bitwise operations in assembly language. Basic computer architecture: pin definitions and supporting chips. Memory and memory interfacing. Basic I/O and device interfacing: I/O programming in assembly and programmable peripheral interface (PPI). Interfacing the parallel and serial ports. (Prerequisite: EE- 215 and EC-225).			

Module 31			
Code	**Course/Module Title**	**ECTS**	**Semester**
ENG004	Engineering Statistics & Probability	4	5
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	53

Description

This course provides an elementary introduction to probability and statistics with applications. Topics include: basic combinatorics, random variables, probability distributions, Bayesian inference, hypothesis testing, confidence intervals, and linear regression.

This course includes weekly recitations mainly to solve problems, review material presented in class, and engage students in bi-weekly 30-minute mini-quizzes. Along with these small quizzes, there is a final exam.

This course seeks the balance between mathematical rigor and applications. No previous familiarity with probability or statistics is assumed. However, students should be conversant with basic linear algebra (vectors and matrices) and calculus (derivatives, and integrals).

Emphasis is on probability theory and its applications, with a smaller module at the end covering basic topics in statistics (parameter estimation, hypothesis testing and regression analysis). The probability part includes events and their probability, the Total Probability and Bayes' Theorems, discrete and continuous random variables and vectors, the Bernoulli trial sequence and Poisson process models, conditional distributions, functions of random variables and vectors, statistical moments, second-moment uncertainty propagation and second-moment conditional analysis, and various probability models such as the exponential, gamma, normal, lognormal, uniform, beta and extreme-type distributions. Throughout the subjects, emphasis is on application to engineering and everyday life problems.

Module: 31			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE321	Communication Systems II	8	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	106

Description

The Communication Systems module provides you with a detailed understanding of how communication systems work, from theoretical concepts through to the design of practical communication systems. Topics include:
Aspects of Digital-to-Analog Conversion: Data Element Versus Signal Element, Data Rate Versus Signal Rate, Bandwidth, Carrier Signal.
Digital Transmission of Analog Signals: Sampling Theorem and its applications.
Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation (generation and Demodulation).
Quadrature Amplitude Modulation (generation and Demodulation), Multidimensional Signaling.
Signaling Schemes with Memory: CPFSK, and CPM. Digital Representation of Analog Signals, Pulse Code Modulation (PCM).
PCM System Issues in digital transmission: Time Division Multiplexing, TDM Hierarchy.
Multicarrier Modulation and OFDM.
Digital-to-digital conversion: line coding, block coding, and scrambling.
Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders.
Phase-Shift Keying, Frequency-Shift Keying, Amplitude-Shift Keying, QASK, QFSK, and QPSK.
Emerging digital communication technologies: Artificial intelligence (AI) and machine learning (ML), Blockchain and Web3 technology, Intelligent automation and robotic process automation (RPA), Internet of things (IoT), Quantum computing.
Quality of Service (QoS): Delay, Reliability, Jitter.

Module: 31

Code	Course/Module Title	ECTS	Semester
ECE321	Communication Systems II	8	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	106

Description

The Communication Systems module provides you with a detailed understanding of how communication systems work, from theoretical concepts through to the design of practical communication systems. Topics include:
Aspects of Digital-to-Analog Conversion: Data Element Versus Signal Element, Data Rate Versus Signal Rate, Bandwidth, Carrier Signal.
Digital Transmission of Analog Signals: Sampling Theorem and its applications.
Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation (generation and Demodulation).
Quadrature Amplitude Modulation (generation and Demodulation), Multidimensional Signaling.
Signaling Schemes with Memory: CPFSK, and CPM. Digital Representation of Analog Signals, Pulse Code Modulation (PCM).
PCM System Issues in digital transmission: Time Division Multiplexing, TDM Hierarchy.
Multicarrier Modulation and OFDM.
Digital-to-digital conversion: line coding, block coding, and scrambling.
Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders.
Phase-Shift Keying, Frequency-Shift Keying, Amplitude-Shift Keying, QASK, QFSK, and QPSK.
Emerging digital communication technologies: Artificial intelligence (AI) and machine learning (ML), Blockchain and Web3 technology, Intelligent automation and robotic process automation (RPA), Internet of things (IoT), Quantum computing.
Quality of Service (QoS): Delay, Reliability, Jitter.

Module 32			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE322	Information Theory and coding	5	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	78
Description			
This course provides to enable students to can understand the main ideas of complex text and sentences on both concrete and abstract topics, including technical discussions in his or her field of specialization. Their abilities will be improving by participate in meetings in the classmate and understanding their idea. Talk about education, experience, strengths and weaknesses, and discuss your career path. Using appropriate language in social stations, including praising and expressing, sympathy, synonymous and antonymous. Talk about qualities of text and how you can deal with it and analyses. Although progress will depend on the type of this course and the previous level of a cumulative instruction.			

Module 33			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE323	Antenna	6	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103
Description			
The course will give students a thorough understanding of the fundamental radiation mechanisms of antennas and thereby get an overview of the special characteristics of the most common antenna types. One should also get a good construction background for such antennas as well as an understanding of how the antennas are included in different radio systems Keywords: Fundamental antenna properties. Radiation from general current sources in free space. Array antennas. Analysis of some important types like electrically small antennas, resonant antennas, broadband antennas, and aperture antennas including reflector antennas. The method of moments for computing the current distribution on wire antennas. This course builds on the fundamental EM field concepts learned in EC 314.			

Module 34			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE324	Computer Architecture	4	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	0	47	53
Description			
This course is a study of the evolution of computer architecture and the factors influencing the design of hardware and software elements of computer systems. Topics may include: instruction set design; processor micro-architecture and pipelining; cache and virtual memory organizations; protection and sharing; I/O and interrupts; in-order and out-of-order superscalar architectures; vector supercomputers; multithreaded architectures; symmetric multiprocessors; and parallel computers			

Module 35			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE 325	Numerical Analysis	7	6
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	3	94	81
Description			
This course will emphasize the development of numerical algorithms to provide solutions to common problems formulated in science and engineering. The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. The emphasis of the course will be the thorough study of numerical algorithms to understand the guaranteed accuracy, large scale systems, and stability. Topics include the standard algorithms for numerical computation: root finding for nonlinear equations, interpolation and approximation of functions by simpler computational building blocks (for example - polynomials and splines), numerical differentiation and divided differences, numerical quadrature and integration, numerical solutions of ordinary differential equations and boundary value problems. An important component of numerical analysis is computational implementation of algorithms which are developed in the course in order to observe first-hand the issues of accuracy, computational work effort, and stability. Exercises will include computational experiments in a programming language of the student's choice. One class lecture will be devoted to a high level pseudo-code type programming language (Matlab) which will suffice in case students have not had prior programming experience. Attendance is required and the exams will be over the lectures and homework.			

Module 37			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE412	Microwave Engineering	6	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103
Description			
This course uses electromagnetic principles to present the theory & operation of simple circuit devices & antennas at microwave frequencies, which are the part of modern microwave communication equipment. The emphasis is placed on planar guiding & radiating structures that enable either hybrid &/or monolithic integration of the devices. Modern CAD software packages are introduced & demonstrated through simulations of microwave networks & antenna configurations. This course builds on the fundamental EM field concepts learned in EC 314.			

Module: 38			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE413	Digital Signal Processing	7	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	113
Description			
Digital signal processing (DSP) refers to various techniques for improving the accuracy and reliability of digital communications. The theory behind DSP is quite complex. Basically, DSP works by clarifying, or standardizing, the levels or states of a digital signal. The course covers theory and methods for digital signal processing, including basic principles governing the analysis and design of discrete-time systems as signal processing devices. Review of discrete-time linear, time-invariant systems, Fourier transforms and z-transforms. Topics include sampling, impulse response, frequency response, finite and infinite impulse response systems, linear phase systems, digital filter design, and implementation, discrete-time Fourier transforms, discrete Fourier transform and the fast Fourier transform algorithms.			

Module 39			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE414	Digital systems Design	6	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103

Description

This module looks at the methodology of designing and implementing large digital systems. Students taking this module will learn how to design reliable digital systems using synchronous design techniques, will learn how to design digital systems which are easily testable and will be able to use a range of software tools to synthesize digital systems. This course deals with principles of complex digital system design by means of development environments, which allow design automation based on hardware description languages. The different modeling levels and approaches to digital system design are considered based on complex digital components. The course enables the students to understand basic concepts of complex digital system design based on development environments, which allow design automation by means of hardware description languages.

The term digital system refers to elements such as hardware, software and networks and their use. There may be many different components that make up one system; for example, a computer has a central processing unit, a hard disk, keyboard, mouse, screen etc. A peripheral device is a digital component that can be connected to a digital system, for example, a digital camera or printer.

Module: 40			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE415	Computer Communications and Networks	6	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2	2	62	88
Description			
This course focuses on fundamental concepts, principles, and techniques in Computer Communications and Networks. The course will introduce basic networking concepts, including the protocol, network architecture, reference models, layering, service, interface, multiplexing, switching, and standards. An overview of digital communication from the perspective of computer networking will also be provided. Topics covered in this course include Internet (TCP/IP) architecture and protocols, network applications, congestion/flow/error control, routing and internetworking, data link protocols, error detection and correction, channel allocation and multiple access protocols, communication media and selected topics in wireless and data centre networks. It will cover recent advances in network control and management architectures by introducing the concepts of software-defined networking (SDN) and network (function) virtualization. Students taking this course will gain hands-on experience in network programming using the socket API; network traffic/protocol analysis; and assessment of alternative networked systems and architectures.			

Module: 41			
Code	**Course/Module Title**	**ECTS**	**Semester**
UNI007	Ethics	2	7
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
2		31	19
Description			
Engineering ethics are principles and guidelines engineers follow to ensure their decision-making is aligned with their obligations to the public, their clients, and the industry. They are the set of rules and guidelines that engineers adhere to as a moral obligation to their profession and to the world. Engineering is a professional career that impacts lives. When ethics are not followed, disaster often occurs; these disasters not only include huge monetary costs and environmental impacts but also often result in the loss of human life. Engineering Ethics applies to every engineer and is very important. This course concentrates on learning students the Following Principles: Honesty and integrity, fairness, honesty, integrity, Respect for life, law, the environment, and public good, Accuracy, rigor, Leadership and communication.			

Module 42			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE422	**VLSI Technology**	6	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	103

Description

This courses of very large-scale integration is a process of embedding or integrating hundreds of thousands of transistors onto a singular silicon semiconductor microchip. VLSI technology's conception started when advanced level processor (computer) microchips were also in their development stages. Two of the most common VLSI devices are the microprocessor and the microcontroller.

Typically, electronic circuits incorporate a CPU, RAM, ROM, and other peripherals on a single PCBA. However, very large-scale integration (VLSI) technology affords an IC designer the ability to add all of these into one chip. If we examine the electronics landscape over the last few decades, we will see evidence of its rapid growth. The benefits include increased functionality, improved miniaturization, and increased overall performance. However, this demand to place more components while increasingly utilizing less space translates into a lower margin for error. The remarkable growth of the electronics industry is primarily due to the advances in large-scale integration technologies. With the arrival of VLSI designs, the number of possibilities for ICs in control applications, telecommunications, high-performance computing, and consumer electronics as a whole continues to rise.

Presently, technologies like smartphones and cellular communications afford unprecedented portability, processing capabilities, and application access due to VLSI technology. The forecast for this trend indicates a rapid increase as demands continue to increase.

Module 43			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE423	Satellite communication	7	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	113
Description			
This course covers fundamentals of satellites, including applications, orbits, propagation and link calculations, system hardware for space and ground segments, multiplexing and multiple access techniques, network design and future trends. Furthermore, it provides students with fundamentals of signals and noise associated with satellite communications, as well as transmission concepts, including analogue transmission rates with respect to distortionless transmission, amplitude and delay distortions with equalisation, nonlinear distortion with companding, and carrier-to-noise ratio; and digital transmission rates with respect to line codes, intersymbol interference, pulse shaping and equalisation, bit energy-to-noise density and error probabilities. This course builds on the fundamental EM field concepts learned in EC 314.			

Module 44			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE424	Wireless and Mobile communication	7	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	1	62	113
Description			
Wireless communication networks offer transmission of signals, such as voice, data, and multimedia, without using wires, which is the crucial part of mobile communications. After successful deployment of wireless cellular networks in licensed bands and Wi-Fi networks in unlicensed bands, such as Industry, Scientific, and Medical (ISM) and Unlicensed National Information Infrastructure (UNII), over the last decade, several wireless networks, application, and services are emerging. Furthermore, wireless networks offer several advantages including mobility while getting service, scalability for further extension, reduced cost-of-ownership, and so on. However, there are some disadvantages and concerns, such as security, data rate, reliability, range, etc. The demand of ubiquitous communications is driving the development of wireless and mobile networks. Wireless communication is the fastest growing segment of the communication industry. Overall, in a very wireless communication organization, data transferred from sender to receiver is placed in a restricted place. With the assistance of Wireless Communication, the sender and receiver may be placed anywhere between a couple of meters such as a Television Remote Control to a couple of thousand kilometers such as Satellite Communication.			

Module 45			
Code	**Course/Module Title**	**ECTS**	**Semester**
ECE425	Optical communication	7	8
Class(hr/w)	**Lect/Lab/Prac./Tutor**	**SSWL(hr/w)**	**USWL(hr/w)**
3	0	47	128
Description			
Electromagnetic theory of guided waves: Maxwell's equations, ray optics, wave optics. Optical fibers: mode analysis, solutions for step-index fiber, dispersion and losses, graded-index fiber, single-mode fiber, fiber manufacture, cables and components, connectors, joints and couplers, fiber transducers. Optical sources: laser principles, semiconductor junction lasers, light emitting diodes, fiber interface, couplings, laser safety. Detectors: avalanche photo-diode, pin photo-diode. Electro-optic devices and Integrated optics. Fiber communications: digital transmission requirements, pulse dispersion, fiber bandwidth, rise-times, optical transmitters, regenerators, system losses, rise-time calculations, performance standards, design of digital fiber systems. This course builds on the fundamental EM field concepts learned in EC 314.			

MODULE DESCRIPTION FORM

Module Information معلومات المادة الدراسية					
Module Title	Mathematic-I			**Module Delivery**	
Module Type	**Basic**			**Theory** **☒ Lecture** **Lab** **x Tutorial** **☐ Practical** **☐ Seminar**	
Module Code	**ENG001**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Mohammed Mizal Rashid		**e-mail**	mohammed,rashid@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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	The aims of teaching and learning mathematics are to encourage and enable students to: 1. Recognize that mathematics permeates the world around us, appreciate the usefulness, power and beauty of mathematics. Enjoy mathematics and develop patience and persistence when solving problems 2. understand and be able to use the language, symbols and notation of mathematics ,develop mathematical curiosity and use inductive and deductive reasoning when solving problems, become 3. confident in using mathematics to analyze and solve problems both in school and in real-life situations 4. develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics 5. Develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others. Develop a critical appreciation of the use of information and communication technology in mathematics .appreciate the international dimension of mathematics and its multicultural and historical perspectives
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** **On successful completion of this course, students will be able to:** 1. Students are required to apply mathematical skills to resolve engineering problems by: 2. • correctly determining the solution to engineering problems 3. • use standard mathematical symbols, layouts and annotation 4. • selecting appropriate information from resources (such as data tables and formulae) to be able to evaluate engineering solutions 5. • selecting and applying standard mathematical techniques and methods to address real-world engineering problems 6. • use methods of communicating mathematical information, including formulas, tables and graphs 7. • analyses mathematical data 8. Students can understand mathematics, equations and algorithms to study communication systems engineering 9. an ability to conduct the main concepts of Applications of Derivatives 10. the ability to develop the functions , rational functions and Analyze Graph the Function 11. Limit and Continuous function

Indicative Contents المحتويات الإرشادية	It is necessary to use teaching aids for mathematics and the use of charts, displaying data, in order to facilitate the material for the student, although it helps the student to understand mathematics faster The presence of classrooms designed and equipped with the necessary display screens that help the teacher to use PowerPoint to present the lesson and explain it to his students in a very easy and simplified way. The presence of teaching aids for mathematics that facilitate the task of the teacher in teaching this subject to his students. Designing and preparing teaching aids for mathematics to help students master the material through them, which helps students understand mathematics. Solve many examples and write the main equations for each topic, such as the Laplace and Fourier rule.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching mathematic I to first-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple mathematic concepts and number systems, . 3. Contextual Learning: Present the concepts of mathematic in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of mathematic learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

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	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Functions and their Graphs
Week 2	Circles and Conic Sections
Week 3	Limit Laws
Week 4	Differentiation Rules
Week 5	Velocity, Speed, and other rates of change
Week 6	Implicit Differentiation
Week 7	Mid. Exam I
Week 8	Related Rate of changes, Maximum and Minimum
Week 9	Graphic with rational functions
Week 10	Curve sketching with first and second derivatives
Week 11	Review of Trigonometric Functions
Week 12	Derivatives of Trigonometric Functions
Week 13	Inverse Functions and their Derivatives
Week 14	Mid. Exam II
Week 15	Functions and their Graphs
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	mathematic, by Thomas L.	No
Recommended Texts	Thomas-calculus	No
Websites	http://dl.konkur.in/post/Book/Paye/Thomas-Calculus-14th-Edition-%5Bkonkur.in%5D.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	Electrical Circuits I			**Module Delivery**	
Module Type	Core			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE112				
ECTS Credits	8.00				
SWL (hr/sem)	200				
Module Level	1 1		**Semester of Delivery**	1	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Mohammed Zuhair Azeez		**e-mail**	Mohammad.zuhair@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Obtain professional-level employment in the Electrical Engineering field 2. Practice Electrical Engineering in a wide variety of private and government institutions 3. Work in diverse, multi-disciplinary teams and possess leadership skills, ethical standards, environmental concerns and social awareness 4. Engage in lifelong-learning, participate in professional organizations and, if desired, pursue graduate studies 5. Obtain licensure as a professional engineer. 6. to develop professionally through lifelong learning, advanced education, and other creative pursuits in science and technology
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Recognize how electricity works in electrical circuits. 2. List varouis terms associated with electrical circuits. 3. Duscuss the reaction and involvement of atoms in electric circuits. 4. Descripe electrical power, charge and current 5. Define ohm's law 6. Identify the basic elements and their applications. 7. Discuss the operations of sinusoid and phasors in electric circuit. 8. Explain the two Kirchoff's laws used in circuit analysis
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Introduction to Electrical Circuits - Basic concepts and definitions - Circuit elements and symbols 2. Voltage, Current, and Resistance - Ohm's Law - Series and parallel connections - Voltage and current division 3. Circuit Analysis Techniques - Kirchhoff's Laws - Nodal and mesh analysis 4. Circuit Theorems - Thevenin's and Norton's theorems - Superposition theorem 5. DC Circuit Analysis - Series and parallel circuits - Voltage and current sources - Power calculations

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching electrical circuits to 1st-year students: Learning Strategies: 1. Conceptual Understanding: Focus on developing a strong conceptual understanding of electrical circuits by studying fundamental principles, theories, and equations. 2. Active Learning: Engage in hands-on activities, such as building circuits, conducting experiments, and solving problems, to reinforce theoretical concepts. 3. Visual Learning: Utilize visual aids, such as diagrams, circuit diagrams, and animations, to enhance understanding of circuit components and their interactions. 4. Problem-solving Practice: Regularly practice solving circuit problems of varying complexity to strengthen problem-solving skills and apply theoretical knowledge. 5. Collaborative Learning: Engage in group discussions, study groups, or collaborative projects to exchange ideas, explain concepts to peers, and learn from each other's perspectives. 6. Real-life Applications: Relate electrical circuits to real-world applications, such as electronics, power systems, or communication systems, to understand their practical significance. 7. Online Resources: Utilize online resources, including interactive simulations, virtual labs, and educational websites, to supplement classroom learning and gain additional practice. Teaching Strategies: 1. Conceptual Framework: Present a clear conceptual framework at the beginning of the course, highlighting the key concepts, theories, and relationships in electrical circuits. 2. Demonstrations: Use live demonstrations, experiments, or multimedia presentations to visually illustrate circuit behavior, component characteristics, and circuit analysis techniques. 3. Interactive Discussions: Encourage students to actively participate in discussions, ask questions, and provide explanations to foster a deeper understanding of concepts. 4. Problem-solving Sessions: Dedicate class time to solving circuit problems together, step-by-step, while explaining the reasoning behind each step to enhance problem-solving skills. 5. Simulations and Virtual Labs: Incorporate computer-based simulations and virtual lab exercises to provide a virtual hands-on experience, allowing students to experiment with circuits and observe their behavior. 6. Formative Assessments: Use regular quizzes, short assignments, or class polls to gauge students' understanding, identify areas of difficulty, and provide timely feedback. 7. Practical Applications: Connect circuit theory to practical applications through real-world examples, case studies, and industry-related projects to highlight the relevance and applicability of electrical circuits.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	93	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Basic Concepts of Electrical Circuit
Week 2	Electrical Resistance
Week 3	Serial and Parallel Resistance
Week 4	Ohm's Law, Voltage & current Divider Rule
Week 5	Source Conversion
Week 6	Kirchhoff's Laws
Week 7	**Mid-term Exam**
Week 8	Branch Current Analysis Method
Week 9	Mesh current
Week 10	node voltage analysis method
Week 11	Delta to Star Connection
Week 12	Superposition Therom
Week 13	Th'evenin Therom
Week 14	Norton Therom
Week 15	Maximum power Transfer Therom
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab -1: Introduction to Lab. Equipements & Use of AVO
Week 2	Lab -2: Ohm's Law / I
Week 3	Lab -3: Series & Parallel D.C ccts / I
Week 4	Lab -4: Series & Parallel D.C ccts / II
Week 5	Lab -5: Kirchhoff's Laws / I
Week 6	Lab -6: Kirchhoff's Laws / II
Week 7	**Mid- term Exam I**
Week 8	Lab -7: Delta to Star Connection/I
Week 9	Lab -8 : Superposition Therom
Week 10	Lab -9 : Th'evenins Therom
Week 11	Lab -10 : Norton Therom
Week 12	**Final- term Exam II**

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, 5th Edition,	No
Recommended Texts	THERAJA	yes
Websites	https://www.allaboutcircuits.com/textbook/ https://www.electronics-tutorials.ws/dccircuits/dcp_1.html	

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	Electronic Physics			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE113**				
ECTS Credits	**7.0**				
SWL (hr/sem)	**175**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Durgham Al-Shebanee		**e-mail**	durgham.alshebanee@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Have a background on the JFET transistors including the construction and biasing. 2. **U**nderstand the construction and physical properties of the depletion-mode MOSFET transistors and Enhancement mode MOSFET transistors. 3. Design of biasing networks of MOSFET circuits including the fixed-bias configuration and self-bias configuration. 4. Understand the small signal model of MOSFET in various applications. 5. Design the single stage amplifiers including the common source amplifiers, source followers, and common gate amplifiers. 6. Analyze the differential amplifiers. 7. Have a background on feedback networks and its basic types. 8. Analyze the high frequency response in MOSFET amplifiers. 9. Understand the Op-Amp basics and specifications. 10. Understand the oscillator circuit and its types. 11. Design of AC/DC converters.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. an ability to apply knowledge of mathematics, science, and engineering, 2. an ability to design an electronic circuit, system, component, or process to meet desired needs within realistic constraints, 3. the ability to function on teams, 4. an ability to identify, formulate, and solve engineering problems, 5. an understanding of professional and ethical responsibility 6. an ability to communicate effectively, 7. an education necessary to understand the impact of engineering solution in a global, economic, environmental, and societal context 8. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Indicative Contents المحتويات الإرشادية	1. Construction and Characteristics of JFETs, transfer Characteristics, Important Relationships 2. Depletion-Type MOSFET, Enhancement- Type MOSFET 3. Fixed-Bias Configuration, Self-Bias Configuration 4. Enhancement- type MOSFET Common Source Amplifier MOSFET 5. Common-Gate Configuration, Common-Drain Configuration 6. Differential Amplifier 7. Feedback Configuration, Designing MOSFET Amplifier Networks 8. Frequency Response, Low-Frequency Response, Multistage Frequency Effects 9. High frequency response 10. Op-AMP Basics 11. Op-Amp Specifications 12. Oscillator Operation, Tuned Oscillator Circuit, Crystal Oscillator

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Electronics III to Third-year students: 1. Develop into competent and engaged engineering professionals and apply their technical and managerial qualifications in the planning, designing, constructing, operating, and/or maintaining of the infrastructure concerning the field of electronic and communications engineering. 2. Using their skills to analyze and design systems, identify project execution means and materials, carry out cost estimation and analyses, and participate in directing technical activities for electronic and communications engineering projects or projects related to other fields. 3. Be able to actively participate in their communities and their profession by developing their oral, written, visual and graphic modes communication abilities when working as team members or leaders. 4. Initiate a program of continuous learning which may include studies leading to proficient licensure or a higher degree in engineering that provides continued development of their technical abilities and management skills, and attainment of professional expertise. 5. Improve their understanding of sustainability, professionalism, ethics, quality performance, and safety that allows them to be professional influential to society when solving engineering problems and creating solutions in the field of electronic and communications engineering.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	128	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 6, and 8

Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Construction and Characteristics of JFETs, transfer Characteristics, Important Relationships.
Week 2	Depletion-Type MOSFET, Enhancement- Type MMOSFET
Week 3	Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Biasing
Week 4	Common-Gate Configuration, Depletion Type MOSFET Biasing, Enhancement- type MOSFET Biasing Combination Networks
Week 5	JFET Small-Signal Model, Fixed-Bias Configuration, Self Bias Configuration, Voltage Divider biasing
Week 6	Common-Gate Configuration, Common-Drain Configuration, Depletion-Type MOSFET, Enhancement-Type MOSFETs.
Week 7	Mid-term Exam
Week 8	E-MOSGFET Drain-Feedback Configuration, E-MOSFET Voltage-Divider Configuration. Designing FET Amplifier Networks Cascade Configuration.
Week 9	FET Frequency Response, Low-Frequency, Response of FET, High Frequency Response of FET, Multistage Frequency Effects.
Week 10	Op-AMP Basics, Practical Op-Amp Circuits (Linear Systems)
Week 11	Op-Amp Specifications (DC Offset Regenerative Comparator a Coeamerars (Nealincar Systems).
Week 12	Preciaton AC/DC Converters, Waveform Wien Bridge, Generators, Regenerative Comparator Phase-Shift and Wren Schrait Triege Oecillators.
Week 13	Oscillator Operation, Phase-Shift Oscillator.
Week 14	Wien Beidge Oscillator, Tuned Oscillator Circuit, Crystal Oscillator.
Week 15	FET Frequency Response, Low-Frequency Respanse of FET, High Frequency Response of FET, Multistage Frequency Effects.
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Fundamentals of microelectronics" by Razavi, Behzad.	No
Recommended Texts	"CMOS analog design using all-region MOSFET modeling" by Schneider, Márcio Cherem, and Carlos Galup-Montoro	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	Engineering Drawing			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENG003**				
ECTS Credits	**4.00**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Hasanain Atiyah		**e-mail**	hasanainatiayh@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Understand the different types of lines and which types will be use, drawing sheet. 2. To know about different types of projection. 3. To know about projection points, straight lines, solids shapes and etc. 4. To know development of different types of orthographic project. 5. To know isometric projection. 6. To know different projection angles and find the third view of projection.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Get information about the important instruments for Engineering drawing. 2. Learning how to draw the lines, shapes, and others which is essential for engineering. 3. Develop student's imagination and ability to represent the compounds size and specifications of physical appearance. 4. Understand the main idea of using dimension in real life. 5. Familiarize with different drawing instrument, technical standard (imperial and metric). 6. Explain the principles of orthographic projection theory. 7. Understand the types of section. 8. Learning the main idea for estimate the third projection and draw the orthographic projection. 9. Learning how to draw isometric view for difference components.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. **Introduction to graphic communication:** - Drawing (Artistic, technical drawing) - Types of technical drawings (parallel and perspective). - Application of Technical drawing. 2. **Drawing equipment's and their use:** - Drawing sheet, Triangles, T-square, Protractor, Scale, Pencil, Compass, and divider. - Lettering and lines - types of lines and using 3. **Technical of Geometric construction:** - How to Bisect a line or Arc - How to Divide a line in to number of equal parts - How to Bisect an Angle -How to draw an Arc or circle (radius) through three given points -How to draw a line parallel to a straight line at a given distance

	-How to draw a perpendicular to line at a point method previous -How to draw a (square, pentagon, hexagon) 4**. Projection:** - introduction (isometric drawing, orthographic or multi view projection) - Theory of multi view projections - orthographic projection (views, the six principle views). - Combination of views (first and third angle projections). 5. **Isometric projection:** - Isometric drawing (Box construction) - Lines in isometric drawing (hidden, center lines) 6**. Sectioning:** - Sectional views - Cross-sectional views - how sections are shown (cutting plane lines, direction of sight, and section lining) - multi-section views

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching Electronics III to Third-year students: 1. Develop into competent and engaged engineering professionals and apply their technical and managerial qualifications in the planning, designing, constructing, operating, and/or maintaining of the infrastructure concerning the field of electronic and communications engineering. 2. Using their skills to analyze and design systems, identify project execution means and materials, carry out cost estimation and analyses, and participate in directing technical activities for electronic and communications engineering projects or projects related to other fields. 3. Be able to actively participate in their communities and their profession by developing their oral, written, visual and graphic modes communication abilities when working as team members or leaders. 4. Initiate a program of continuous learning which may include studies leading to proficient licensure or a higher degree in engineering that provides continued development of their technical abilities and management skills, and attainment of professional expertise. 5. Improve their understanding of sustainability, professionalism, ethics, quality performance, and safety that allows them to be professional influential to society when solving engineering problems and creating solutions in the field of electronic and communications engineering.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	38	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 6, and 8
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to graphic communication
Week 2	Engineering drawing instruments
Week 3	Types of Lines
Week 4	Geometric methods group 1
Week 5	Geometric methods group 2
Week 6	Projection theory (combination of views)
Week 7	Mid-term Exam
Week 8	Classification of surface and lines in multi view projections
Week 9	Dimensioning
Week 10	Sectioning
Week 11	How can section show
Week 12	Drawing section in figure
Week 13	Isometric projection
Week 14	How can you draw circle in isometric view
Week 15	Finding the third view via orthographic projection theory
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab -1: Hidden, continuous, section, and inclining lines
Week 2	Lab -2: Geometric methods 1 (Bisect a line or Arc, Divide a line to number of equal parts)
Week 3	Lab -3: Geometric methods 2 (draw a square, pentagon, hexagon)
Week 4	Lab -4: Orthographic projection
Week 5	Lab -5: First and third projection
Week 6	Lab -6: Draw the projection in First view
Week 7	Mid- term Exam
Week 8	Lab -7: Draw the projection in third view
Week 9	Lab -8 : Isometric drawing

Week 10	Lab -9 : Section views
Week 11	Lab -10 : Cross-sectional views
Week 12	Lab-11: multi-sections views
Week 13	Lab-12: Find the third projection and drawn isometric

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering drawing textbook, A. R. Khafaf, University of technology	yes
Recommended Texts	Technical Engineering drawing	No
Websites	https://ia600107.us.archive.org/18/items/TextbookOfEngineeringDrawing_201802/Textbook%20of%20Engineering%20Drawing.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	**Computer I**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UNI004**				
ECTS Credits	**3.00**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Eng.	
Module Leader	ghusoon jawad abd al kadhum		**e-mail**	ghadeerabd.ece@mu.edu.i	
Module Leader's Acad. Title			**Module Leader's Qualification**	M.Sc.	
Module Tutor	---		**e-mail**	---	
Peer Reviewer Name	-----		**e-mail**		
Scientific Committee Approval Date	/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	Develop an understanding of how computing technology presents new ways to address problems; and to use computational thinking to analyses problems and to design, develop and evaluate solutions. read, write, test, and modify computer programs.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems 2. Design, correctly implement and document solutions to significant computational problems 3. Analyze and compare alternative solutions to computing problems 4. Implement software systems that meet specified design and performance requirements 5. Work effectively in teams to design and implement solutions to computational problems 6. Communicate effectively, both orally and in writing 7. Recognize the social and ethical responsibilities of a professional working in the discipline
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to the computer DOS Windows operating system Start menu Taskbar control Board File handling WordPress interface Create indexes and margins Data export Excel program interface Cell handling Dealing with prepared equations Write equations manually Create and control charts PowerPoint interface Dealing with tools Animations and effects additions Preparing final offers

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The strategy used in this course is outcome base learning. It is to test achievement of learning outcomes and changing upon. The instructor will focus on materials those expanding students' critical thinking skills. The course was designed in a way such that students are to take environmental considerations into account in their professional work and personal life even when they are not willing to become environmental engineer. The course will give the basics of the field and how to obtain additional information as engineers require it in their careers and will give them good opportunity to understand the methods of solving environmental problems and consider that in their structural or transportation work. Quizzes will be based on the material covered in class. This material comes from a variety of sources and may go beyond the information covered in the text. Quizzes and final exam will typically consist of both quantitative and qualitative questions. In all quizzes or final exam a student will need to show all work on quantitative problems. Group assignments and reports will be open book, note and neighbor. The quizzes will be closed book, notes and neighbor. Assignments that cannot be read or are not presented in a professional engineering style will not receive credit. Final exam will be comprehensive. Plagiarism is a serious offense and will not be tolerated. Plagiarism will result in a zero for the assignment. Due dates will be given in class. Late papers may be accepted but will be docked 10% per day, including weekends and starting immediately following class. Students with excused absences will be given a reasonable amount of time to catch up on their work with no penalty. No assignments will be accepted after the solution been returned or posted, whichever Occurs first.

Student Workload (SWL) الحمل الدراسي للطالب			
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	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
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	20% (20)	5, 10	LO #1, 7
	Assignments	4	10% (10)	2, 6 ,9 and 11	LO # 1, 7
	Projects / Lab.				
	Report				
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction to Windows 10**
Week 2	**Work with icons**
Week 3	**use windows**
Week 4	**files and folders**
Week 5	**Accessories**
Week 6	**The main interface of Microsoft Word 2010 / general settings**
Week 7	**Texts/graphics/tables**
Week 8	**Dealing with slides and creating presentations (power point 2010)**

Week 9	**Backgrounds and Themes / Transition Effects / Animations tab**
Week 10	**Slide Show/Print and Presentation Tab**
Week 11	**Dealing with Microsoft Office Excel**
Week 12	**Mathematical and arithmetic functions**
Week 13	**Statistical functions**
Week 14	**Boolean/conditional function (IF)**
Week 15	**Introduction to Windows 10**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Introduction to Windows 10**
Week 2	**Work with icons**
Week 3	**use windows**
Week 4	**files and folders**
Week 5	**Accessories**
Week 6	**The main interface of Microsoft Word 2010 / general settings**
Week 7	**Texts/graphics/tables**
Week 8	**Dealing with slides and creating presentations (power point 2010)**
Week 9	**Backgrounds and Themes / Transition Effects / Animations tab**
Week 10	**Slide Show/Print and Presentation Tab**
Week 11	**Dealing with Microsoft Office Excel**
Week 12	**Mathematical and arithmetic functions**
Week 13	**Statistical functions**
Week 14	**Boolean/conditional function (IF)**
Week 15	**Introduction to Windows 10**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Computer Basic**	Yes
Recommended Texts	**EXCEL Formulas –Almunther Saffan**	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	**اللغة العربية**			**Module Delivery**	
Module Type	**Support**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UNI003**				
ECTS Credits	**2.0**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Eng.	
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	/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	أهداف الدرس تتلخص في الآتي: ١. تمكين الطالب من كتابة التقارير باللغة العربية بشكل صحيح وتجنب الاخطاء اللغوية والاملائية والاسلوبية.

	٢. تطوير قدرة النطق الفصيح لدى الطالب للتمكن من التواصل بحرفية خلال العمل. ٣. توسعة فهم الادب العربي لانماء اساليب الكتابة في العربية. ٤. توسعة القدرة على التعبير وطرح الافكار بلغة عربية رصينة.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	يفترض بالانتهاء من تدريس هذه المادة أن يكون الطالب قد تحصل على القدرات التالية: ١. القدرة على التواصل بمهارة شفهيًا مع فرد أو مجموعة من الأشخاص بوسائل البيان اللغوية وفي الكتابة بالعربية على مستويات إدارية مختلفة. ٢. القدرة على إدراك الضرورة المستمرة لنمو المعرفة باللغة العربية والكتابة المهنية وكيفية العثور على المعلومات حولها وتطبيقها بشكل صحيح. ٣. القدرة على التحدث والكتابة بشكل مناسب دون أخطاء في القواعد العربية الاساسية. ٤. القدرة على الكتابة بشكل مناسب دون أخطاء في الاملاء.
Indicative Contents المحتويات الإرشادية	مراجعة الكلمة واقسامها، المعرب والمبني، وأفعال الماضي والمضارع والامر واحوالها (٥ ساعات)، مراجعة العلامات الفرعية التي تلحق بالافعال والاسماء (٥ ساعات)، همزات القطع والوصل، الهمزة المتوسطة، وعلامات الترقيم (٥ ساعات)، الجمل الاسمية والفعلية (٥ ساعات)، التاء المربوطة والتاء المفتوحة (٥ ساعات)، الحروف الناسخة والافعال اللازمة والمتعدية (٥ ساعات)، أدوات الجر (٥ ساعات)، نماذج من النصوص العربية (١٠ ساعات)، أخطاء شائعة في الكتابة بالعربية (١٥ ساعة)،أمثلة تطبيقية لكتابة التقارير بالعربية (٤٠ ساعة).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	تقوم استراتيجية التعلم على التغيير المستمر بحسب مخرجات التعلم ومدى تحققها. سيركز استاذ المادة على الاخطاء اللغوية الشائعة ومحاولة تفاديها بالنسبة للطلبة عند استعمالهم اللغة في مجالات العمل. سيركز أيضا خلال الدرس على ثلاثة عناصر رئيسية وهي القواعد، والاملاء والأدب لتحسين قدرة الطالب للتواصل شفهيا وكتابيا باللغة العربية.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.2
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	٣٠% (٣٠)	6, 11	LO # 1-٤
	Assignments	2	10% (10)	4, 10	LO # 1-٤
	Projects / Lab.	-	-	-	-
	Report/lab.	-	-	-	-
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-٤
	Final Exam	3 hr	50% (50)	16	LO # 1-٤
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	مراجعة الكلمة واقسامها، المعرب والمبني، وأفعال الماضي والمضارع والامر واحوالها
Week 2	مراجعة العلامات الفرعية التي تلحق بالافعال والاسماء
Week 3	همزات القطع والوصل، الهمزة المتوسطة، وعلامات الترقيم
Week 4	الجمل الاسمية والفعلية
Week 5	التاء المربوطة والتاء المفتوحة
Week 6	الحروف الناسخة والافعال اللازمة والمتعدية
Week 7	أدوات الجر، والمجرور بحرف الجر والمجرور بالاضافة
Week 8	نماذج من النصوص العربية
Week 9	نماذج من النصوص العربية (تواصل للدرس السابق)
Week 10	أخطاء شائعة في الكتابة
Week 11	أخطاء شائعة في الكتابة (تواصل للدرس السابق)
Week 12	أخطاء شائعة في الكتابة (تواصل للدرس السابق)
Week 13	أمثلة تطبيقية لكتابة التقارير بالعربية
Week 14	أمثلة تطبيقية لكتابة التقارير بالعربية (تواصل للدرس السابق)
Week 15	أمثلة تطبيقية لكتابة التقارير بالعربية (تواصل للدرس السابق)
Week 16	**مراجعة**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**الميسر في اللغة العربية: المستوى الاول: النحو والصرف والاملاء، سمير بن يحيى المعبر، دار حافظ، المملكة العربية السعودية، جدة، 1423 هجـ، 2003 م.**	كلا (النسخة الاليكترونية فقط)
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: MarksDecimal 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 II			**Module Delivery**	
Module Type	**Basic**			**Theory** **☒ Lecture** **Lab** **x Tutorial** **☐ Practical** **☐ Seminar**	
Module Code	**ENG005**				
ECTS Credits	**5.00**				
SWL (hr/sem)	**125**				
Module Level	1 1		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Eng.	
Module Leader	Mohammed Mizal Rashid		**e-mail**	mohammed,rashid@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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	The aims of teaching and learning mathematics are to encourage and enable students to: 1. Recognize that mathematics permeates the world around us; appreciate the usefulness, power and beauty of mathematics. Enjoy mathematics and develop patience and persistence when solving problems 2. understand and be able to use the language, symbols and notation of mathematics ,develop mathematical curiosity and use inductive and deductive reasoning when solving problems, become 3. confident in using mathematics to analyze and solve problems both in school and in real-life situations 4. develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics 5. Develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others. Develop a critical appreciation of the use of information and communication technology in mathematics .appreciate the international dimension of mathematics and its multicultural and historical perspectives
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Students are required to apply mathematical skills to resolve engineering problems by: 2. correctly determining the solution to engineering problems 3. an ability to understanding trigonometric functions 4. an ability to understanding Methods of Integration • 5. use methods of communicating mathematical information, including formulas, tables and graphs 6. an education necessary to understand the impact of Applications of Definite Integrals,
Indicative Contents المحتويات الإرشادية	It is necessary to use teaching aids for mathematics and the use of charts, displaying data, in order to facilitate the material for the student, although it helps the student to understand mathematics faster The presence of classrooms designed and equipped with the necessary display screens that help the teacher to use PowerPoint to present the lesson and explain it to his students in a very easy and simplified way. The presence of teaching aids for mathematics that facilitate the task of the teacher in teaching this subject to his students. Designing and preparing teaching aids for mathematics to help students master the material through them, which helps students understand mathematics. Solve many examples and write the main equations for each topic, such as the Laplace and Fourier rule .

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching mathematic I to first-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple mathematic concepts and number systems, . 3. Contextual Learning: Present the concepts of mathematic in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of mathematic learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

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	63	**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, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

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 -II			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ECE122				
ECTS Credits	**8.00**				
SWL (hr/sem)	**200**				
Module Level	1 1		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Eng.	
Module Leader	Mohammed Zuhair Azeez		**e-mail**	Mohammad.zuhair@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSc.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE112	**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. Obtain professional-level employment in the Electrical Engineering field 2. Practice Electrical Engineering in a wide variety of private and government institutions 3. Work in diverse, multi-disciplinary teams and possess leadership skills, ethical standards, environmental concerns and social awareness 4. Engage in lifelong-learning, participate in professional organizations and, if desired, pursue graduate studies 5. Obtain licensure as a professional engineer. 6. to develop professionally through lifelong learning, advanced education, and other creative pursuits in science and technology
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	On successful completion of this course, students will be able to: 1. Be able to systematically obtain the equations that characterise the performance of an AC electric circuit as well as solving both single phase and three-phase circuits in sinusoidal steady state, 2. Acknowledge the principles of operation and the main features of electric machines and their applications , 3. Acquire skills in using electrical measuring devices, 4. Be aware of electrical hazards and able to implement basic actions to avoid unsafe work conditions , 5. Ability to design and conduct experiments, as well as to analyze and interpret data. 6. Ability to design and conduct experiments, as well as to analyze and interpret data, 7.Graduates will demonstrate an ability to design electrical and electronic circuits, power electronics, power systems; electrical machines analyze and interpret data, 8. Ability to utilize experimental, statistical and computational methods and tools necessary for engineering practice 9. Knowledge of contemporary issues.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Introduction to AC Circuits: - Definition and properties of alternating current (AC) - Sinusoidal waveforms and periodic functions - Phasors and complex representation of AC quantities 2. AC Circuit Analysis: - Ohm's Law and impedance in AC circuits - Series and parallel AC circuits

	- Power calculations in AC circuits - Resonance in AC circuits 3. AC Circuit Components: - Capacitors in AC circuits - Inductors in AC circuits 4. AC Circuit Analysis Techniques: - Mesh and nodal analysis for AC circuits - Thevenin's and Norton's theorems in AC circuits - Superposition theorem for AC circuits 5. AC Circuit Measurements and Instruments: - AC voltage and current measurements - Oscilloscopes and their applications in AC circuits - AC circuit simulation and analysis software

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching electrical circuits to 1st-year students: Learning Strategies: 1. Conceptual Understanding: Focus on developing a strong conceptual understanding of electrical circuits by studying fundamental principles, theories, and equations. 2. Active Learning: Engage in hands-on activities, such as building circuits, conducting experiments, and solving problems, to reinforce theoretical concepts. 3. Visual Learning: Utilize visual aids, such as diagrams, circuit diagrams, and animations, to enhance understanding of circuit components and their interactions. 4. Problem-solving Practice: Regularly practice solving circuit problems of varying complexity to strengthen problem-solving skills and apply theoretical knowledge. 5. Collaborative Learning: Engage in group discussions, study groups, or collaborative projects to exchange ideas, explain concepts to peers, and learn from each other's perspectives. 6. Real-life Applications: Relate electrical circuits to real-world applications, such as electronics, power systems, or communication systems, to understand their practical significance. 7. Online Resources: Utilize online resources, including interactive simulations, virtual labs, and educational websites, to supplement classroom learning and gain additional practice. Teaching Strategies: 1. Conceptual Framework: Present a clear conceptual framework at the beginning of the course, highlighting the key concepts, theories, and relationships in electrical circuits.

	2. Demonstrations: Use live demonstrations, experiments, or multimedia presentations to visually illustrate circuit behavior, component characteristics, and circuit analysis techniques. 3. Interactive Discussions: Encourage students to actively participate in discussions, ask questions, and provide explanations to foster a deeper understanding of concepts. 4. Problem-solving Sessions: Dedicate class time to solving circuit problems together, step-by-step, while explaining the reasoning behind each step to enhance problem-solving skills. 5. Simulations and Virtual Labs: Incorporate computer-based simulations and virtual lab exercises to provide a virtual hands-on experience, allowing students to experiment with circuits and observe their behavior. 6. Formative Assessments: Use regular quizzes, short assignments, or class polls to gauge students' understanding, identify areas of difficulty, and provide timely feedback. 7. Practical Applications: Connect circuit theory to practical applications through real-world examples, case studies, and industry-related projects to highlight the relevance and applicability of electrical circuits.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	93	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.2
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Basic concepts of AC circuit
Week 2	Average and RMS Value
Week 3	Representation of AC (Voltage and Current) By Phasors
Week 4	Single Phase AC Circuits
Week 5	Series AC Circuits
Week 6	Parallel AC Circuits
Week 7	**Mid-term Exam**
Week 8	Power in AC Circuits
Week 9	Representation of AC Circuits using J operator
Week 10	Analysis of AC Circuits
Week 11	Analysis of AC Circuits
Week 12	Analysis of AC Circuits
Week 13	Analysis of AC Circuits
Week 14	Series Resonance
Week 15	Parallel Resonance
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab -1: **Introduction to AC Equipments**
Week 2	Lab -2: **Cathod Ray Tube/I**
Week 3	Lab -3: **Cathod Ray Tube/II**
Week 4	Lab -4: **Series AC Circuits/I**
Week 5	Lab -5: **Series AC Circuits/II**
Week 6	Lab -6: **Parallel AC Circuits/I**
Week 7	**Mid- term Exam I**
Week 8	Lab -7: **Parallel AC Circuits/II**
Week 9	Lab -8 : **Frequency Response of AC Circuits/I**
Week 10	Lab -9 : **Frequency Response of AC Circuits/II**
Week 11	Lab -10 : **Series Resonance**
Week 12	**Mid- term Exam II**

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, 5th Edition,	No
Recommended Texts	THERAJA	yes
Websites	https://www.allaboutcircuits.com/textbook/ https://www.electronics-tutorials.ws/dccircuits/dcp_1.html	

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	**حقوق الإنسان والديمقراطية**			**Module Delivery**	
Module Type	**Support**			☐ **Theory** ☒ **Lecture3** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UNI006**				
ECTS Credits	**2.0**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Eng.	
Module Leader	يونس شعيل عجيل		**e-mail**		
Module Leader's Acad. Title	مدرس		**Module Leader's Qualification**	Ph. D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**		
Scientific Committee Approval Date	/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	١) تعريف شامل ومركز بحقوق الإنسان ابتداء من جذور نشأتها والتطورات التي شهدتها هذه الحقوق الإنسانية عبر العصور والمجتمعات البشرية وإسهام الشرائع السماوية والأديان والحضارات في رفدها بالقيم والمثل مرورا بمختلف العصور. ٢) بيان الاعتراف الدولي بهذه الحق وق من قبل المنظمات الدولية، وفي مقدمتها الأمم المتحدة، ثم الاعتراف الإقليمي في مختلف بقاع العالم. ٣) دور المنظمات غير الحكومية المعنية بحقوق الإنسان وقانون الدولة الإنساني وأهداف تلك المنظمات ووسائل عملها ودورها في تطور احترام وحماية حقوق الإنسان. ٤) الضمانات العملية لحقوق الإنسان على الصعيد الوطني في الدساتير والتشريعات الوطنية متمثلة بالضمانات الدستورية والقضائية، ثم الضمانات السياسية إلى جانب الدور الذي تقوم به المنظمات الوطنية المعنية بحقوق الإنسان في الدفاع عن هذه الحقوق وحمايتها. ٥) دور الأمم المتحد وأجهزتها ووكالاتها المختصة في احترام وحماية حقوق الإنسان وكذلك دور المنظمات الإقليمية في ها الميدان. ٦) دور المنظمات الحكومية سواء على المستوى العالمي أو على المستوى الإقليمي في حماية واحترام حقوق الإنسان ٧) تفعيل العقل والتفكير والإبداع والحرص على المشاركة الديمقراطية بكل تفاصيلها ومبادئ العدالة الاجتماعية.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	١) إمداد الطلاب بأكثر قدر ممكن من المعلومات والمعارف التي تمكنهم من الوقوف على حقوق الإنسان من حيث مفهومها وأهدافها ومبادئها وأهمية تطبيقها في حياتهم، ليعرفوا ما لهم من حقوق وما عليهم من واجبات تجاه دينهم وبلادهم وأمتهم والناس أجمعين. ٢) إكساب الطلاب القدرة على التعلم الذاتي والتعليم المستمر باعتبارهما من أهم أساليب النمو المعرفي والتكيف مع المستجدات العلمية والعملية في مجال حقوق الإنسان. ٣) القيم والممارسات الأخلاقية المهنية التي ترتبط بقوانين وتشريعات حقوق الإنسان. ٤) إيقاف الطلاب على طرق الإفادة من التقنيات المعاصرة التي جاءت بها العولمة، والمتمثلة في الفضائيات والحاسب الآلي والأنترنت، وأنها تتيح لهم فرص الاطلاع على المعلومات والمعارف المختلفة المتعلقة بحقوق الإنسان، سواء ذات العلاقة بالمجال المحلي أو الإقليمي أو العالمي، بما في ذلك ما يصدر من قوانين دولية عن منظمات حقوق الإنسان. ٥) إمكانية جعل الطالب واعياً لحقوق الإنسان ليساعد الناس على فهم حقوقهم وواجباتهم. ٦) تدريب الطلبة على تطبيق حقوق الإنسان والحرية والديمقراطية في الحياة اليومية. ٧) تمكين الطالب من دراسة أهم الحقوق التي ضمنتها له الشريعة الإسلامية والدساتير العراقية لا سيما الدستور النافذ لسنة 2005 فضلا عن معرفة الطالب للمواثيق الدولية التي صدرت بخصوص حقوق الإنسان.
Indicative Contents المحتويات الإرشادية	١) تعميم ثقافة حقوق الإنسان لعموم المجتمع وبالأخص العملية التعليمية ٢) ضمان تنشئة أجيال متعاقبة تقوم على معرفة القوانين والتشريعات الخاصة بحقوق الإنسان. ٣) تفعيل العقل والتفكير والإبداع والحرص على المشاركة الديمقراطية بكل تفاصيلها ومبادئ العدالة الاجتماعية

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	١) أسلوب المحاضرة إذا يتخلل المحاضرات الحوار الهادف والمناقشة البناءة بين الطلاب والأستاذ. ٢) التعلم التعاوني ..وذلك تقسيم الطلاب إلى مجموعات صغيرة وتمكينهم من مناقشة أفكار الدرس المختلفة بعد تضمينها المعلومات التي تتعلق بقضية أو مشكلة تتعلق بحقوق الإنسان ويطلب من الطلاب تحليلها وإبداء الرأي حولها ومناقشتها أمام كافة زملاء الصف ٣) دراسة الحالة: وذلك من خلال عرض الحالة موضوع الدراسة إي المشكلة المتعلقة بحقوق الإنسان في صورة قصة غير منتهية ويطلب من الطلاب من خلال أسئلة تُعيرها مسبقاً أن يحللوا القصة، ويناقشوها، ويبدوا آراءهم حول مضامينها، ومن ثم يصنعون النهاية المناسبة.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.2
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	All
	Assignments	2	10% (10)	2, 12	All
	Projects / Lab.				
	Report	2	20% (20)	6, 12	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	All
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	مقدمة في تعريف حقوق الإنسان، ماهية حقوق الإنسان.
Week 2	حقوق الإنسان في المواثيق الدولية، حقوق الإنسان في المواثيق الإقليمية، حقوق الإنسان في التشريعات الوطنية
Week 3	حقوق الإنسان في الحضارات القديمة، حقوق الإنسان في الأديان السماوية، حقوق الإنسان في العصور الوسطى والحديثة
Week 4	الاعتراف المعاصر بحقوق الإنسان،
Week 5	تصنيفات حقوق الإنسان
Week 6	وسائل حماية حقوق الإنسان، ضمانات حقوق الإنسان
Week 7	الفساد الإداري وتأثيره على حقوق الإنسان
Week 8	القانون الدولي الإنساني وقانون حقوق الإنسان، تطبيق الأمم المتحدة للقانون الدولي الإنساني وقانون حقوق الإنسان.
Week 9	الحرية(مفهومها_ أهميتها، تعريفها)،
Week 10	نشأة وتطور الحريات العامة، أنواع الحريات العامة، معوقات الحرية
Week 11	دور القانون في مجال الحريات العامة، الحريات العامة وحقوق الإنسان من الترادف إلى التمايز.
Week 12	مقدمة في تعريف الديمقراطية، التطور التاريخي لمفهوم الديمقراطية (الحضارات القديمة)، التطور التاريخي لمفهوم الديمقراطية (الأديان السماوية
Week 13	الديمقراطية في العصور الوسطى والحديثة والمعاصرة
Week 14	أشكال الديمقراطية، الشروط العامة لنجاح النظام الديمقراطي،
Week 15	مفهوم الانتخابات وتكيفها القانوني البرلمان، تطبيق النظام الديمقراطي في العراق
Week 16	تهيئة للامتحان النهائي

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts	حقوق الإنسان.. الدكتور حميد حنون خالد	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	Electronic Materials			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE124**				
ECTS Credits	**8.00**				
SWL (hr/sem)	**200**				
Module Level	1 1		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Eng.	
Module Leader	Durgham Al-Shebanee		**e-mail**	durgham.alshebanee@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Have a background on the Energy bound Theory in Crystals. 2. Understand the Conductors, Semiconductor and insulator. 3. Study in detail Fermi level. 4. Understand the electrical conduction. 5. Study the metallic crystal under magnetic field. 6. Analyze the resistance, temperature, and super conductivity. 7. Have a detailed background on semiconductors. 8. Understand the crystal structure representative. 9. Study the intrinsic semiconductor and intrinsic conductors 10. understand P-N junction, diode equation and biasing 11. Analyze the junction transistors.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**1. On successful completion of this course, students will be able to:** 2. an ability to apply knowledge of mathematics, science, and engineering 3. an ability to understand the behaviour of the electronic component, system, component, or process to meet desired needs within realistic constraints 4. the ability to function on teams 5. an ability to identify, formulate, and solve engineering problems 6. an understanding of professional and ethical responsibility 7. an ability to communicate effectively 8. an education necessary to understand the impact of engineering solution in a global, economic, environmental, and societal context 9. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Indicative Contents المحتويات الإرشادية	1. Energy bound Theory in Crystals 2. Conductors, Semiconductors and insulators 3. Fermi level 4. Electrical Conduction 5. Metallic Crystal under Magnetic Field 6. Resistance and Temperature, Super Conductivity 7. Semiconductors 8. Crystal structure representation 9. Intrinsic Semiconductors, Intrinsic Conductors 10. Extrinsic Semiconductors 11. P-N junctions 12. Junction transistors

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Electronic Materials to First-year students: 1. Develop into competent and engaged engineering professionals and apply their technical and managerial qualifications in the planning, designing, constructing, operating, and/or maintaining of the infrastructure concerning the field of electronic and communications engineering. 2. Using their skills to analyze and design systems, identify project execution means and materials, carry out cost estimation and analyses, and participate in directing technical activities for electronic and communications engineering projects or projects related to other fields. 3. Be able to actively participate in their communities and their profession by developing their oral, written, visual and graphic modes communication abilities when working as team members or leaders. 4. Initiate a program of continuous learning which may include studies leading to proficient licensure or a higher degree in engineering that provides continued development of their technical abilities and management skills, and attainment of professional expertise. 5. Improve their understanding of sustainability, professionalism, ethics, quality performance, and safety that allows them to be professional influential to society when solving engineering problems and creating solutions in the field of electronic and communications engineering.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	107	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	93	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.2
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 6, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6

	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Energy bound Theory in Crystals
Week 2	Conductors, Semiconductors and insulators
Week 3	Fermi level
Week 4	Electrical Conduction
Week 5	Metallic Crystal under Magnetic Field
Week 6	Resistance and Temperature, Super Conductivity
Week 7	Mid-term Exam
Week 8	Semiconductors
Week 9	Crystal structure representative
Week 10	Intrinsic Semiconductors, Intrinsic Conductors
Week 11	Extrinsic Semiconductors
Week 12	Conduction of Charge Carrier in Semiconductors
Week 13	The P-N junction Diode
Week 14	Diode Equation and biasing
Week 15	The junction Transistors
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	“Solid state electronic devices “ By Ben G. Streetman, Sanjay Kumar Banerjee.	No
Recommended Texts	"Electronic devices and circuit theory 11th ed." By Boylestad, Robert L., and Louis Nashelsky.	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
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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	Technical English Language I			**Module Delivery**	
Module Type	**Support**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UNI001**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Eng.	
Module Leader	Hasanain Atiyah		**e-mail**	hasanainatiayh@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Understand and use very common everyday expressions and simple phrases for communicate. 2. They can introduce themselves to other colleagues, can ask and answer questions about personal details, such as where they live, things they like and people they know. 3. To know the time should be use the simple tenses. 4. Practice with classmates to share their ideas. 5. They can communicate in a simple way if the other colleagues talk slowly and clearly. 6. To develop knowledge and understanding of linguistic diversity and variability within and across societies.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Can understand and use familiar everyday social expressions. 2. Learning how introduce themselves and satisfaction. 3. Develop their ability to ask and answer questions about personal details. 4. Understand how can introduce where someone lives. 5. Describe in simple terms aspects of their background. 6. Understand the sentences and frequently used expressions related to areas. 7. Learning how exchange of information on familiar and routine matters. 8. Can deal with most situation likely to arise whist travelling in an area where the language is spoken.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. **Possessive adjectives and pronouns:** - Wh-questions and possessive - How to choose the right word (a, an, and the) - Singular and plural nouns. 2. **Verb to be:** - Social expression 1. - Social expression 2. - What is the difference between (it, it's, their, there, they're) 3. **The countries and the languages:** - Present simple. - How much is/are - Time is countable or noncountable -On time and in time what the different between them -Saying the time -Writing and telling the time -Adverbs of frequency

	4**. Question words:** - Some and any - There is/there are - This/that - Was/were 5. **The Past simple:** - Irregular verbs -Positive answer - Questions and negatives 6**. Adverbs:** - Modal verbs - Can - Would like

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in Technical English language I to one-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning, Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 7. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction and Hello!
Week 2	Your world
Week 3	All about you
Week 4	Family and friends
Week 5	The way I live
Week 6	Every day
Week 7	Mid-term Exam
Week 8	My favourites
Week 9	Where I live
Week 10	Time past
Week 11	We had a great time!
Week 12	Please and thank you
Week 13	Here and now
Week 14	It's time to go!
Week 15	Ready to join the meeting!
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	New Headway Beginner student's Book	yes
Recommended Texts	Series of IELTS booklet, edition by University of Cambridge, 2019, United Kingdom.	No
Websites	English lecturer-free study help, English-literaturer.com.	

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	ENG002				
ECTS Credits	3.00				
SWL (hr/sem)	75				
Module Level	1		**Semester of Delivery**	2	
Administering Department	ECE		**College**	Eng	
Module Leader	Abbas Swayeh Atiya		**e-mail**	abbasswayeh22@mu.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**	MSc	
Module Tutor	Ahmad Muslim		**e-mail**		
Peer Reviewer Name	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-Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. 2- A workshop can introduce a new concept, spurring participants to investigate it further on their own, or can demonstrate and encourage the practice of actual methods. It's a great way to teach hands-on skills because it offers participants a chance to try out new methods and fail in a safe situation
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	ورشة النجارة يتعلم فيها الطالب على اهمية الخشب في واقع الحياة اليومية –انواع الخشب ميزاته وعيوبه -تطبيقاته بالإضافة الى تطبيق عملي حول النجارة ورشة البرادة يتعرف فيها الطالب على اهمية البرادة وانواع البرادة وادواتها بالإضافة الى طريقة البرادة مع اخذ تطبيق عملي عليها ورشة الخراطة واحدة من الورش التي يكتسب فيها الطالب معلومات جديدة حول عمليات القطع والتشغيل باستخدام ماكنات الخراطة- التعرف على الاجزاء الاساسية في ماكنات الخراطة مع عمليات الخراطة الاساسية ورشة الصحية من مخرجات التعلم لورشة الصحية هي التعرف على انواع الانابيب البلاستيكية المستخدمة في التأسيسات الصحية مع ميزاتها وعيوبها و طرق ربطها وتصنيفها سواء كانت للصرف الصحي او انابيب الغاز و المزاريب ورشة اللحام من مخرجاتها تعريف الطالب بأهمية تقنية اللحام التي هي عبارة عن وصل قطعتين غير قابلة للفك و اكتساب معلومات اضافية حول تصنيف انواع اللحام –الغازات المستخدمة للحام- ماكينات اللحام مع تطبيق دروس عملية عليه ,
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	استراتيجية درس الورش في الهندسة المدنية هي اولا اكتساب الطالب معلومات حول كل من النجارة والخراطة والسباكة واللحام والبرادة والتأسيسات الصحية كمعلومات عامة مفيدة في واقع الحياة اليومية بالإضافة الى تطبيق جزء منها في الهندسة المدنية ثانيا وتعتبر النقطة المهمة هي تشجيع الطالب على العمل اليدوي واكتساب المهارة مع اهمية تطبيق قوانين السلامة المهنية والتي تعتبر مهمه جدا في أي مجال للعمل بعد التخرج

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	28	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.87
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.				
	Report	4	10% (10)	6 , 12	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 للمختبر

	Material Covered
Week 1	مقدمة حول مواضيع الورش
Week 2	تعريف مفردات وادوات القياس
Week 3	شرح حول ورشة النجارة الادوات المستخدمة في ورشة النجارة انواع الاخشاب-عيوب الاخشاب
Week 4	تطبيق عملي عن النجارة
Week 5	شرح حول وحدة البرادة ادوات البرادة انواع المبارد انواع المناشير ماكنات الثقب انواع اقلام القطع-
Week 6	درس عملي عن البرادة
Week 7	شرح حول وحدة السمكرة ادوات السمكرة
Week 8	تطبيق عملي عن السمكرة
Week 9	امتحان(ورشة النجارة البرادة السمكرة)
Week 10	شرح حول ورشة الخراطة الاجزاء الرئيسية لماكنات الخراطة انواع ادوات القطع المعادن التي تصنع منها ادوات القطع
Week 11	درس عملي عن الخراطة
Week 12	شرح حول ورشة الصحية-انواع انابيب البلاستيك-انابيب الصرف الصحي- انابيب الغاز - ميزاتها عيوبها وطرق اللحام لها-انواع الغراء-طرق تمديد شبكات التغذية-
Week 13	تطبيق عملي عن ورشة الصحية
Week 14	شرح حول ورشة اللحام انواع اللحام ماكنات اللحام
Week 15	تطبيق عملي عن ورشة اللحام
Week 16	امتحان(ورشة الخراطة- الصحية- اللحام)

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
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	Mathematics III			**Module Delivery**	
Module Type	**Basic**			**Theory** ☒ **Lecture** **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE211**				
ECTS Credits	**5.00**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	1	
Administering Department	ECE		**College**	Eng.	
Module Leader	Mohammed Mizal Rashid		**e-mail**	mohammed,rashid@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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	The aims of teaching and learning mathematics are to encourage and enable students to: 1. Recognize that mathematics permeates the world around us, appreciate the usefulness, power and beauty of mathematics. Enjoy mathematics and develop patience and persistence when solving problems 2. understand and be able to use the language, symbols and notation of mathematics ,develop mathematical curiosity and use inductive and deductive reasoning when solving problems, become 3. confident in using mathematics to analyze and solve problems both in school and in real-life situations 4. develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics 5. Develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others. Develop a critical appreciation of the use of information and communication technology in mathematics .appreciate the international dimension of mathematics and its multicultural and historical perspectives
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. an ability to apply knowledge of Laplace transformer 2. Solution of ordinary differential equation 3. Sequence &series : definition of sequence , limit theorem , definition of infinite series tables and formulae) to be able to evaluate engineering solutions 4. selecting and applying standard mathematical Triple integral : in Cartesian coordination , cylindrical , spherical coordination 5. use methods of Vector analysis 6. Understanding Fourier transform: definition of FT, FT of different time domain function ,Inverse of Fourier transform
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: It is necessary to use teaching aids for mathematics and the use of charts, displaying data, in order to facilitate the material for the student, although it helps the student to understand mathematics faster The presence of classrooms designed and equipped with the necessary display screens that help the teacher to use PowerPoint to present the lesson and explain it to his students in a very easy and simplified way. The presence of teaching aids for mathematics that facilitate the task of the teacher in teaching this subject to his students. Designing and preparing teaching aids for mathematics to help students master the material through them, which helps students understand mathematics. Solve many examples and write the main equations for each topic, such as the Laplace and Fourier rule.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching mathematic I to first-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple mathematic concepts and number systems, . 3. Contextual Learning: Present the concepts of mathematic in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of mathematic learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

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	63	**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, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	ordinary differential equations, definition, type, order, degree, solution , separable variable, exact integrating factor
Week 2	Solution of ordinary differential equation: linear engineering applications
Week 3	Second order differential equations: undetermined coefficients, variation of parameters
Week 4	Engineering applications of Second order differential equations, vector analysis : introduction , line integral
Week 5	Vector analysis : diverge and curl of vector function, green's theorem , surface integral
Week 6	Divergence theorem , stock' theorem , monthly exam
Week 7	Multiple integral : double integral : Cartesian coordination , polar coordination
Week 8	Triple integral : in Cartesian coordination , cylindrical , spherical coordination
Week 9	Sequence &series : definition of sequence , limit theorem , definition of infinite series
Week 10	Sequence &series: test of converge (comparison test, integral test, ratio test, root test , power series
Week 11	Fourier series : periodic function , harmonic Fourier series, even and odd function
Week 12	Exponential form of Fourier series, engineering applications, … monthly exam
Week 13	Fourier transform: definition of FT, FT of different time domain function
Week 14	Inverse of Fourier transform
Week 15	Engineering application
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	mathematic, by Thomas L.	No
Recommended Texts	Thomas-calculus	No
Websites	http://dl.konkur.in/post/Book/Paye/Thomas-Calculus-14th-Edition-%5Bkonkur.in%5D.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	Electronics I			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE212**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	ECE		**College**	Eng.	
Module Leader	Moneer Ali lilo		**e-mail**	moneerlilo@mu.edu.iq	
Module Leader's Acad. Title	Assistance Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE124	**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 concept of semiconductor material, and behaviors of semiconductor devices, their relevance to electronic and communication engineering. 2. Explain the diodes types , diode application and the main characteristics of the diode and Zener diode. 3. Understand the application of the different types of the diodes such as clamper, clipper, and regulator for the protection system. 4. Understand the design electronic circuit based on used the electronic elements such as (diode , resistance , capacitor) to concept the theorems related to them. 5. Explain the basic operation of the transistor based on the three regions of the transistor characteristic (operation, saturation, and cut-off) region. 6. Understand the common- base transistor behaviours based on design and analysis the electronic circuit and show the action of common – base in the three regions of operation. 7. Explain the common- emitter transistor behaviours based on design and analysis the electronic circuit and show the action of common- emitter in the three regions of operation. 8. Understand the common- collector transistor behaviours based on design and analysis the electronic circuit and show the action of common- collector in the three regions of operation
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	On completion of the course, student will be able to: 1. Design and analyze the basic operations of MOSFET. 2. Know about the multistage amplifier using BJT and FET in various configuration to determine frequency response and concept of voltage gain. 3. Know about different power amplifier circuits, their design and use in electronics and communication circuits. 4. Know the concept of feedback amplifier and their characteristics. 5. Design the different oscillator circuits for various frequencies 6. Know the transistor high frequency working and its frequency response 7. Design simple circuits using voltage regulators and IC 555 8. Compare ideal op. amp and practical op. amp. 9. Distinguish between JFET and BJT.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1- Concept semiconductor material - Analysis effect of the physical parameters on the semiconductor material - Mathematical method to find charge , voltage and resistive of semiconductor material 2- Diode characteristics and circuit design - Diode type

	- Diode c/c with different application - Design and analysis electronic circuit with diode applications 3- Zener Diode characteristics and circuit design - Zener diode type - Zener diode c/c with different application - Design and analysis electronic circuit with Zener diode applications 4- Transistor characteristics - Transistor behaviours input / output c/c - Transistor analysis based on (operation, saturation, and cut-off) regions 5- common- base transistor behaviours - input / output c/c of the common- base model - analysis and design electronic circuit of common- base model 6- common- emitter behaviours - input / output c/c of the common- emitter model - analysis and design electronic circuit of common- emitter model - common- collector behaviours - input / output c/c of the common- collector model - analysis and design electronic circuit of common- collector model

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning.

	Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Semiconductor diode, ideal versus practical
Week 2	Resistance levels, diode equivalent circuit
Week 3	Transition and diffusion capacitance, reverse recovery time , diode specification sheet , diode testing ,
Week 4	Zener diodes , light- emitting diodes , Load line analysis , series diode configuration ,
Week 5	parallel and series- parallel configuration , AND/OR gates
Week 6	Half-wave rectification , full-wave rectification
Week 7	Clippers , clampers
Week 8	Zener diode , voltage – multiplier circuit
Week 9	BJT transistor construction and operation , common – bias configuration
Week 10	common – emitter configuration, common – collector configuration
Week 11	Transistor test , operation point (Q- point) , fixed bias configuration
Week 12	Emitter- bias configuration, voltage divider bias configuration
Week 13	Collector feedback configuration, emitter – follower configuration, common – base configuration
Week 14	Miscellaneous bias configuration
Week 15	Design operation , transistor switching network , bias stabilization
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Devices and Circuit Theory (Robert L. Boylestad & Louis Nashelsky), 11th ed.(ISBN 978-0-13-262226-4).	No
Recommended Texts	Electronic Devices, by Thomas l. Floyd, 7th ed., (ISBN: 0-13-127827-4).	No
Websites	https://www.booksfree.org/analog-circuit-design-by-john-h-pdf-free-download/	

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 I			**Module Delivery**	
Module Type	**Core**			**Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE213**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	ECE		**College**	Eng.	
Module Leader	Aws Hashim Neamah		**e-mail**	aws.hashim@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE112 & ECE122	**Semester**	1 , 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 concept of energy storage elements in electrical networks such as inductor, capacitor and Mutual Inductance and their relevance to electronics and communication engineering. 2. Explain each storage element in detail and how to calculate the specific parameters of each storage element like current and voltage. Study the series-parallel combinations of each storage element to calculate the equivalent value in a given circuit. 3. Explain the Natural and Step Response of First order RL and RC circuits Forms in terms of voltage and current response and calculate the time constant for each combination RL or RC and its effect on the natural and force response of the circuit. 4. Understand the RLC Circuits and how to find the general solution . 5. Understand the concept of Sequential Switching and how its work and what is the effect of this switching in analyzing the response of RLC circuits and Explain the complete response of the circuits with two energy storage elements, 6. Discuss the Natural and Step response of Second order series and Parallel RLC Circuits and general solution with three types of response (Underdamped response, critically and Overdamped damped response). 7. Understand the Natural and Step response of unforced Second order series and Parallel RLC Circuits.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. An ability to apply knowledge of mathematics and principles of electric circuits. 2. An ability to conduct the main concepts of electrical network analysis. 3. Ability to analyze electrical network circuit response with one or two storage elements. 4. The ability to analyze the natural and step responses of second-order series and parallel RLC (resistor-inductor-capacitor) circuits. 5. The ability to compute the complete circuit response in time and frequency domain. 6. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Indicative Contents المحتويات الإرشادية	Indicative Contents of Network Analysis I Course: 1. Energy Storage Elements: • Introduction to energy storage elements • Capacitors and their characteristics • Inductors and their characteristics • Energy storage and release in capacitors and inductors • Energy stored in magnetic and electric fields

2. Inductance:
   - Definition and properties of inductance
   - Inductive circuits and behavior of inductors
   - Calculation of inductance in various configurations
   - Inductive reactance and impedance
   - Inductors in series and parallel
3. Capacitance:
   - Introduction to capacitance
   - Capacitors and their behavior in circuits
   - Calculation of capacitance in various configurations
   - Capacitive reactance and impedance
   - Capacitors in series and parallel
4. Mutual Inductance:
   - Mutual inductance and its significance
   - Coupled inductors and their behavior
   - Calculation of mutual inductance
   - Transformers and their applications
5. Series and parallel combination
   - Series and parallel combinations of resistors, capacitors, and inductors
   - Analysis of series and parallel circuits
   - Voltage and current division in complex networks
   - Thevenin's and Norton's theorems
6. Natural and Step Response of First-order RL Circuits:
   - Analysis of first-order RL circuits
   - Natural response of RL circuits
   - Step response of RL circuits
   - Time constant and its significance
7. Natural and Step Response of First-order RC Circuits:
   - Analysis of first-order RC circuits
   - Natural response of RC circuits
   - Step response of RC circuits
   - Time constant and its significance
8. RLC Circuits and General Solution:
   - Introduction to RLC circuits
   - Analysis of series and parallel RLC circuits
   - Natural and step response of RLC circuits
   - General solution of RLC circuits

	• Resonance in RLC circuits 9. Sequential Switching: • Sequential switching and its applications • Analysis of sequential switching circuits • Transients during switching processes 10. Natural and Step Response of Second-order Series and Parallel RLC Circuits (Underdamped Response): • Second-order RLC circuits and their behavior • Underdamped response and its characteristics • Analysis of underdamped second-order RLC circuits • Natural and step response of underdamped circuits 11. Natural and Step Response of Second-order Series and Parallel RLC Circuits (Critically/Overdamped Response): • Critically and overdamped responses in second-order RLC circuits • Analysis of critically and overdamped circuits • Natural and step response of critically and overdamped circuits 12. Natural and Step Response of Unforced Second-order Series and Parallel RLC Circuits: • Unforced response in second-order RLC circuits • Zero-input response and its characteristics • Analysis of unforced circuits • Natural and step response of unforced circuits These topics cover a range of fundamental concepts and applications in network analysis. The course will provide a comprehensive understanding of circuit behavior, responses, and analysis techniques.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching Network Analysis I to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple electrical network analysis concepts, and progressively introduce the natural and force responses of two and three storage elements circuits.

	3. Contextual Learning: Present the concepts of network analysis circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of network analysis. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.14
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.86
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Energy Storage Elements
Week 2	Inductance
Week 3	Capacitance
Week 4	Mutual Inductance
Week 5	Series-Parallel Combinations
Week 6	Natural and Step Response of First order RL circuits Forms
Week 7	Mid-term Exam
Week 8	Natural and Step Response of First order RC circuits Forms
Week 9	Time Constant
Week 10	RLC Circuits and general solution
Week 11	Sequential Switching
Week 12	Natural and Step response of Second order series and Parallel RLC Circuits and general solution (Underdamped response)
Week 13	Natural and Step response of Second order series and Parallel RLC Circuits and general solution (Critically , Overdamped damped response)
Week 14	Natural and Step response of unforced Second order series RLC Circuits
Week 15	Natural and Step response of unforced Second order Parallel RLC Circuits
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Introduction to electric circuits 9th edition by James A. Svoboda and Richard C. Dorf	No
Recommended Texts	ELECTRIC CIRCUITS by James W. Nilsson and Susan A. Riedel TENTH EDITION	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	**Electromagnetic fields I**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE214**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	ECE		**College**	Eng.	
Module Leader	Riyadh Dakhil Mansoor		**e-mail**	riyadhdmu@mu.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Scientific Committee		**e-mail**	E-mail	
Scientific Committee Approval Date	15/06/2023		**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. Provides the mathematical description of all electrical phenomena, and therefore it is the physical foundation of all Electrical and Computer Engineering disciplines. 2. Explain modern applications of electromagnetics: including wireless communication systems, global navigation systems, bioelectrical phenomena, high-speed computers, and computer networks. 3. Provides instruction in fundamental engineering science and also the basics of modern applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**After the successful completion of the course student should be able to:** 1. Apply vector calculus to static electric-magnetic fields in different engineering situations. 2. Analyze Maxwell's equations in different forms (differential & integral) & apply them to engineering problems. 3. Examine the phenomena of wave propagation in different media & its interfaces & in applications of microwave engineering. 4. Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.
Indicative Contents المحتويات الإرشادية	The indicative contents contain the following 1. Provide a brief overview of vector calculus. Static electric fields, Fundamental postulates of electrostatics, Coulomb's law 2. Explain the Electric field due to a continuous distribution of charges, Electric flux density, Gauss' law 3. Discuss Electrostatic potential 4. Study the behavior of material media (conductors and dielectrics) in a static electric field, 5. Introduce Capacitance and electrostatic energy 6. Learning the Steady electric currents, Continuity of current, Resistance 7. Observing the Static magnetic fields, Fundamental postulates of magnetostatics, Biot-Savart law, Ampere's law

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching electromagnetic theory to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. 3. Contextual Learning: Present the concepts of electromagnetic theory in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate seminars and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of electromagnetic theory learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Vector analysis: scalar
Week 2	Vector fields, vector algebra
Week 3	The vector in cartesian coordinates.
Week 4	The vector in cylindrical and spherical
Week 5	Coulombs law
Week 6	Field intensity of point charge
Week 7	Mid-term Exam
Week 8	N point charges line charge
Week 9	Sheet charge, streamlines
Week 10	Electric flux: faradays experiment
Week 11	Gauss's law with applications
Week 12	Divergence, Div theorem
Week 13	Maxwell's 1st equation
Week 14	Potential: work in electrostatic field
Week 15	Equipotential, the Gradient
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	M. N. O. Sadiku, "Elements of Electromagnetics", 5th Edition, OxfordUniversity Press 2010, ISBN 0195387759, 9780195387759	No
Recommended Texts	W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Edition,TATA Mc Graw Hill, ISBN978007061223	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 Electronics 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	ECE		**College**	Eng.	
Module Leader	Auda Raheemah Odhaib		**e-mail**	auda@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Understand the concept of Number system operation and code, Logic gate, Boolean algebra. 2. Explain the basic logic gates and the simplification methods for logic circuits.. 3. Explain the how implement the combinational circuits. 4. Explain the Universal property of NAND and NOR gats. 5. Explain the basic combinational circuits such as the basic adder, comparator, decoder, Encoder, multiplexer and De multiplexer. 6. Understand the Code converter and parity.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Explain the basic differences between digital and analog quantities. 2. Explain the basic logic operations of NOT, AND, and OR. 3. Explain the universal logic gates (NAND and NOR) and use them to implement any combinational logic function. 4. Perform basic arithmetic calculations in binary, octal, decimal, and hexadecimal number systems; 5. Converting between different number systems. 7. Apply the basic Laws and rules of Boolean algebra. 8. Analyze and synthesize combinational logic circuits; 9. Simplification the combinational circuits using Boolean algebra and Karnaugh map. 10. Design basic combinational logic circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. **Introduction to digital concepts:** - Digital and Analog Quantities. - Binary Digits, Logic Levels and Digital waveforms. - Basic Logic Operations. 2. **Number Systems, operations and Codes:** - Decimal numbers, Binary numbers, Octal numbers and Hexadecimal numbers. - Binary Arithmetic - Digital Code and Parity 3. **Logic gates:** - The basic Logic Gates (NOT, AND, OR) - The Universal Logic Gates (NAND , NOR) - The Exclusive –OR and Exclusive – NOR gate 4**. Boolean Algebra and Logic Simplification:** - Laws and Rules of Boolean Algebra

	- DeMorgan's Theorems - Simplification using Boolean Algebra. - Simplification using Karnaugh Map. 5. **Cobinational Logic :** - Basic Combinational Logic circuits. - Implementing Combinational Logic 6**. Functions of Cobinational Logic:** - Adders - Comparators - Decoders and Encoders - Multiplexers and demultiplexers

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Number system operation and code
Week 2	Signed number , arithmetic operation
Week 3	Hexadecimal number , octal number , BCD code
Week 4	Logic gate
Week 5	Boolean algebra operation and expression
Week 6	Boolean analysis of logic
Week 7	Mid-term Exam
Week 8	Karnugh map, SOP minimization
Week 9	POS minimization and 5 variable
Week 10	implementation of combinational logic
Week 11	Universal property of NAND and NOR gats
Week 12	Basic adder and parallel adder
Week 13	Comparators , decoder and encoder
Week 14	Code converter and parity, Multiplexer and demultiplexer
Week 15	Introduction to programmable logic device
Week 16	**Preparatory week before the final Exam**
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab -1: Basic Logic Gates 1
Week 2	Lab -2: Basic Logic Gates 2
Week 3	Lab -3: Laws and Rules of Boolean Algebra
Week 4	Lab -4: Demorgan's Theorems
Week 5	Lab -5: Universal Property of NAND and NOR gates
Week 6	Lab -6: Basic adders and parallel binary adders
Week 7	Mid- term Exam
Week 8	Lab -7: Basic subtractors
Week 9	Lab -8 : The Magnitude comparator
Week 10	Lab -9 : Decoder
Week 11	Lab -10 : BCD to 7 segment decoder

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital Fundamental, by Thomas L. Floyed	No
Recommended Texts	digital electronics, principles, devices and applications	No
Websites	https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCA/FY/digielec.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	**Computers II**			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UNI005**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	3	
Administering Department	ECE		**College**	Eng.	
Module Leader	Ahmed Hasan Saaudi		**e-mail**	Ahmed.saaudi@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UNI004	**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. Understanding the basic programming concepts 2. Creating C++ programs 3. Tokens, expressions and control structures in C++ 4. Arranging same data systematically with arrays 5. Understanding how C++ improves C with object-oriented features. 6. To learn how to write inline functions for efficiency and performance. 7. Learning the syntax and semantics of the C++ programming language. 8. Understanding the concept of data abstraction and encapsulation. 9. Learning how to overload functions and operators in C++. 10. Learning how to use exception handling in C++ programs.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** • Understand and use the basic programming constructs of C/C++ • Manipulate various C/C++ datatypes, such as arrays, strings, and pointers • Isolate and fix common errors in C++ programs • Use memory appropriately, including proper allocation/deallocation procedures • Write small-scale C++ programs using the above skills • Use functions and pointers in your C++ program • Understand tokens, expressions, and control structures • Explain arrays and strings and create programs using them • Understand and employ file management
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Exploring Programming Basics 2. Introducing C ++ Programming 3. Working with Tokens, Expressions and Control Structures in C++ 4. Managing Input and Output Data 5. Arranging the Same Data Systematically: Arrays 6. Functions and Objects in C++ 7. Pointing to a location: Pointers 8. File Management in C++ 9. Templates in C++ 10. Handling Exceptions in C++ 11. Manipulating Strings in C++ 12. Advanced Labs

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	36	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
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	30% (10)	5, 10	LO #1, 2, 3,4,5,6
	Assignments	2	10% (10)	2, 12	LO # 7,8,9,10,11,12
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Functions, Standard Functions, User-defined Functions**
Week 2	**User-defined Functions, Value Returning functions**
Week 3	**Void Functions, void Functions with parameters**
Week 4	**Void Functions, Reference parameters and memory Allocations**
Week 5	**Array and Strings: One dimensional Arrays, Array as parameters to Functions**
Week 6	**List Processing (search, sort, insert & delete an item from the list)**
Week 7	**Mid-term Exam**
Week 8	**C-String (characters Array), Comparison, Reading and Writing Strings).**
Week 9	**Two dimensional Array**
Week 10	**Processing two dimensional Arrays. Array of Strings and C-Strings (characters Arrays)**
Week 11	**Two dimensional Array and Functions**
Week 12	**Records (structs), struct variables and functions**
Week 13	**Functions and Objects in C++**
Week 14	**Functions and Array in C++**
Week 15	**File Management in C++**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	The C++ Programming Language (4th Edition) By Bjarne Stroustrup	No
Recommended Texts	C++ Primer 5th Edition	No
Websites	https://www.tutorialspoint.com/cplusplus/index.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	Mathematics IV			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE221**				
ECTS Credits	**5.00**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ECE		**College**	Eng.	
Module Leader	Mohammed Mizal Rashid		**e-mail**	mohammed,rashid@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ENG001, ENG005, ENG211	**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 aims of teaching and learning mathematics are to encourage and enable students to: 1. Recognize that mathematics permeates the world around us, appreciate the usefulness, power and beauty of mathematics. Enjoy mathematics and develop patience and persistence when solving problems 2. understand and be able to use the language, symbols and notation of mathematics ,develop mathematical curiosity and use inductive and deductive reasoning when solving problems, become 4. confident in using mathematics to analyze and solve problems both in school and in real-life situations 5. develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics 6. Develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others. Develop a critical appreciation of the use of information and communication technology in mathematics .appreciate the international dimension of mathematics and its multicultural and historical perspectives
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1-An ability to apply knowledge of Engineering applications of Laplace transformer, 2- An ability to conduct the main concepts of Gamma functions , Bessel's equations , Legendre equation 3- Tthe ability to develop ower Z transform : direct Z transform , invers Z transform 4- Second order differential equations: undetermined coefficients, 5- An ability to understanding Fourier series, an education necessary to understand the impact of inverse of Fourier transform, and 6. An ability to use Exponential form of Fourier series, engineering applications.
Indicative Contents المحتويات الإرشادية	It is necessary to use teaching aids for mathematics and the use of charts, displaying data, in order to facilitate the material for the student, although it helps the student to understand mathematics faster The presence of classrooms designed and equipped with the necessary display screens that help the teacher to use PowerPoint to present the lesson and explain it to his students in a very easy and simplified way. The presence of teaching aids for mathematics that facilitate the task of the teacher in teaching this subject to his students. Designing and preparing teaching aids for mathematics to help students master the material through them, which helps students understand mathematics. Solve many examples and write the main equations for each topic, such as the Laplace and Fourier rule.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching mathematic I to first-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple mathematic concepts and number systems, . 3. Contextual Learning: Present the concepts of mathematic in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of mathematic learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Laplace transformer : definition and property, LT of different time domain function
Week 2	Inverse LT, solution of ODE
Week 3	LT of periodic functions
Week 4	Engineering applications of LT
Week 5	Complex function : complex number , curve and region in complex plane , limit , derivative
Week 6	Complex function, analytic function, Cauchy- Riemman equation, Laplace equation: exponential function. trigonometric & hyperbolic function, logarithm and general power , line integer in complex plane
Week 7	Complex functions , power series , residues theorem
Week 8	Power series : definition and classification (ordinary point) regular and irregular singular point
Week 9	Gamma functions , Bessel's equations , Legendre equation, Engineering applications
Week 10	Exam I
Week 11	Differential equation : solution of one dimensional wave heat equation , solution of two dimensional Laplace equation
Week 12	Z transform : direct Z transform , invers Z transform
Week 13	Properties of Z transform , solution of differential equation
Week 14	Exam2
Week 15	Engineering applications
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	mathematic, by Thomas L.	No
Recommended Texts	Thomas-calculus	No
Websites	http://dl.konkur.in/post/Book/Paye/Thomas-Calculus-14th-Edition-%5Bkonkur.in%5D.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	Electronics II			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE222**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Moneer Ali lilo		**e-mail**	moneerlilo@mu.edu.iq	
Module Leader's Acad. Title	Assistance Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE212	**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. Understand the concept of AC signal (AC source), and behaviors of BJT devices, their relevance to electronic and communication engineering. 2. Explain the effect of the AC model for BJT, re- model analysis 3. Understand the re-model of common- base transistor behaviours based on design and analysis the electronic circuit and show the action of common – base in the AC and DC source. 4. Explain the re-model common- emitter transistor behaviours based on design and analysis the electronic circuit and show the action of common- emitter in the AC and DC source. 5. Understand the common- collector transistor behaviours based on design and analysis the electronic circuit and show the action of common- collector in the AC and DC source. 6. Explain the concept of operation amplifier that related to different application with many types of the electronic signal. 7. Explain the effect of the AC model for BJT, h- model analysis 8. Understand how use the operation amplifier with different model based on use h-model for design the electronic circuit 9. Show and analysis the operation amplifier class (A, B, AB, D)based on different applications . 10. Class A , class B , design analysis the operation amplifier circuit. 11. Frequency response with different model of the operation amplifier
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	Per the Department's program assessment outcomes, by the end of this course you should demonstrate the following relevant to electronic and communication engineering, **students will be able to:** 1. An ability to apply knowledge of mathematics, science, and engineering. 2. An ability to design a system, component, or process to meet desired needs within realistic constraints. 3. The ability to function on teams. 4. An ability to identify, formulate, and solve engineering problems. 5. An understanding of professional and ethical responsibility. 6. An ability to communicate effectively. 7. An education necessary to understand the impact of engineering solution in a global, economic, environmental, and societal context. 8. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1- BJT transistor - BJT transistor modeling

	- the RC transistor model 2- BJT transistor configuration re- model - Common-Emitter Fixed – Bias configuration - CE Emitter –Bias configuration 3- Voltage – Divider bias re- model - analysis electronic circuit - Design electronic circuit with different applications 4- Transistor configuration re- model - Emitter – follower configuration - Common – Base configuration 5- feedback configuration - collector feedback configuration 6- effect of Rs and RL - RL determining the current Gain - RS determining the current Gain - Cascaded system, Darlington connection 7- The hybrid equivalent model - approximate hybrid equivalent model 8- BJT frequency response - low – frequency response of BJT - High Frequency response of BJT - multistage frequency effects 9- Power amplifier - series – fed class A amplifier - series – fed class B amplifier - Feedback amplifier

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	81	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.4
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	BJT transistor modeling ,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,
Week 5	collector feedback configuration , collector feedback configuration
Week 6	Effect of R_L and R_S determining the current Gain
Week 7	Cascaded system, Darlington connection
Week 8	The hybrid equivalent model , approximate hybrid equivalent model
Week 9	Voltage – Divider bias ,Emitter – follower configuration , Common – Base configuration,
Week 10	BJT frequency response , low – frequency response of BJT
Week 11	High Frequency response of BJT, multistage frequency effects
Week 12	Square – wave testing , Power amplifier.
Week 13	series – fed class A amplifier , transformer – coupled class A amplifier
Week 14	Class B amplifier operation, class B amplifier circuit , amplifier distortion
Week 15	Feedback amplifier , feedback connection type, voltage – series feedback
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab -1 : BJT transistor biasing self-bias
Week 2	Lab -2 : voltage divider bias configuration
Week 3	Lab -3 : DC bias of BJT circuit
Week 4	Lab -4 : Common emitter amplifier
Week 5	Lab -5 : Common base amplifier
Week 6	Lab -6 : Cascade amplifier
Week 7	Mid- term Exam
Week 8	Lab -7 : Frequency response of CE amplifier
Week 9	Lab -8 : Frequency response of CE amplifier
Week 10	Lab -9 : Frequency response of CB amplifier
Week 11	Lab -10 : Series – fed class A amplifier

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Devices and Circuit Theory (Robert L. Boylestad & Louis Nashelsky), 11th ed.(ISBN 978-0-13-262226-4).	No
Recommended Texts	Electronic Devices, by Thomas l. Floyd, 7th ed., (ISBN: 0-13-127827-4).	No
Websites	https://www.booksfree.org/analog-circuit-design-by-john-h-pdf-free-download/	

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	**ECE223**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ECE		**College**	Eng.	
Module Leader	Aws Hashim Neamah		**e-mail**	aws.hashim@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE112 & ECE122& ECE213	**Semester**	1 , 2, 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. Explain the tool use to analyze the network circuits in frequency domain using Laplace Transform. **2.** Explain the terms of step and impulse function, functional and operational LT and Applying LT and inverse LT and Poles and Zeroes of F(s). **3.** Explain the use of LT in circuit analysis and applications **4.** Discuss Transfer function, Partial functions expansions and Convolution integral as a part of LT method. **5.** Understand the Steady state sinusoidal response , The impulse function in circuit analysis and give an introduction about frequency selective circuits.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. An ability to apply knowledge of mathematics and principles of electric circuits. 2. An ability to conduct the main concepts of electrical network analysis II. 3. Ability to analyze electrical network circuit response with storage elements in the frequency domain. 5. The ability to analyze the electrical network circuits with RLC load using Laplace transform. 6. The ability to compute the complete circuit response (natural and force) in the frequency domain. 7. Understanding the steady-state sinusoidal response and frequency selective circuits as an application of using LT in circuit analysis. 8. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice..
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Introduction to Laplace Transform: • Overview of Laplace Transform and its significance in mathematical analysis. • Relation between the Laplace Transform and the time-domain representation of a function. • Advantages of using Laplace Transform in solving differential equations. 2. Definition of step and impulse function: • Explanation of the unit step function (Heaviside function) and its properties. • Introduction to the Dirac delta function (impulse function) and its properties. • Illustration of how these functions can be used to represent

specific events or signals.

3. Functional and operational Laplace Transform:
    - Understanding the operational properties of Laplace Transform, such as linearity, time shifting, and scaling.
    - Discussion of functional properties like differentiation and integration in the Laplace domain.
    - Application of these properties to simplify calculations and solve problems.
4. Applying Laplace Transform and inverse LT:
    - Techniques for applying Laplace Transform to obtain the transformed representation of a function.
    - Understanding how to use inverse Laplace Transform to recover the original function from its Laplace Transform.
    - Examples and exercises to reinforce the application and inverse application of Laplace Transform.
5. Poles and Zeroes of F(s):
    - Introduction to poles and zeroes of a function in the Laplace domain.
    - Explanation of their significance in determining system behavior and stability.
    - Illustration of how poles and zeroes affect the frequency response of a system.
6. The use of Laplace Transform in circuit analysis and applications:
    - Introduction to using Laplace Transform to analyze electrical circuits.
    - Solving differential equations representing circuit behavior using Laplace Transform.
    - Applications of Laplace Transform in circuit design, filter design, and system analysis.
7. Transfer function:
    - Definition and properties of transfer functions in the Laplace domain.
    - Understanding the transfer function as a mathematical representation of a system's input-output relationship.
    - Analysis of transfer functions to determine system response and stability.
8. Partial fractions expansions:
    - Technique for decomposing a rational function in the Laplace domain into partial fractions.
    - Application of partial fractions expansions to simplify complex

	expressions and solve equations. 9. Convolution integral: • Introduction to convolution integral and its importance in system analysis. • Understanding how to perform convolution using Laplace Transform. • Application of convolution integral in solving differential equations and determining system response. 10. Steady state sinusoidal response: • Analysis of sinusoidal input signals using Laplace Transform. • Determining the steady-state response of a system to a sinusoidal input. • Calculation of amplitude, phase shift, and frequency response of a system. 11. The impulse function in circuit analysis: • Understanding the role of impulse functions in circuit analysis. • Calculation of circuit response to impulse inputs using Laplace Transform. • Examples of practical applications where the impulse function is utilized. 12. Introduction to frequency selective circuits: • Overview of frequency selective circuits and their role in signal processing. • Explanation of different types of frequency selective circuits (e.g., filters). • Understanding the design principles and analysis techniques for frequency selective circuits using Laplace Transform.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching Network Analysis II to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple Laplace transform concepts used in network analysis, and progressively introduce the analysis and the complete response of electrical network circuits using frequency domain.

	3. Contextual Learning: Present the concepts of Laplace transform used in network analysis in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of network analysis II learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	53	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.53
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Laplace Transform
Week 2	Definition of step and impulse function
Week 3	functional and operational LT
Week 4	Applying LT and invers LT
Week 5	Poles and Zeroes of F(s)
Week 6	The use of LT in circuit analysis and applications
Week 7	Mid-term Exam
Week 8	Transfer function
Week 9	Partial functions 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)
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	ELECTRIC CIRCUITS by James W. Nilsson and Susan A. Riedel TENTH EDITION	No
Recommended Texts	Fundamentals of Electric Circuits 5th edition by Charles K. Alexander and Matthew n. o. Sadiku.	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	**Electromagnetic fields II**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE224**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ECE		**College**	Eng.	
Module Leader	Riyadh Dakhil Mansoor		**e-mail**	riyadhdmu@mu.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name	Scientific Committee		**e-mail**	E-mail	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE214	**Semester**	3
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Provides the mathematical description of all electrical phenomena, and therefore it is the physical foundation of all Electrical and Computer Engineering disciplines. 2. Explain modern applications of electromagnetics: including wireless communication systems, global navigation systems, bioelectrical phenomena, high-speed computers, and computer networks. 3. Provides instruction in fundamental engineering science and also the basics of modern applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the Behavior of electrostatic and electromagnetic fields and their application in electrical and electronics engineering fields 2. Understand Maxwell's equation in integral and differential form, their interpretation, and applications 3. Understand the Propagation of EM waves in free space, conductors & dielectrics 4. Apply Maxwell's equations to calculate the electrostatic and magnetostatics fields produced by distributed charges and currents 5. Apply Maxwell's equations to analyze the propagation of waves in conducting and dielectric media 6. Analyze the transmission and reflection of plane waves at the boundary between two materials 7.Analyze propagation in waveguides and the radiation produced by a Hertzian dipole
Indicative Contents المحتويات الإرشادية	1. Introduction of field co-ordinate systems 2. Electrostatics: Coulomb's law, Gauss's law and its applications, the potential functions, Equipotential surface, Poisson's and Laplace's equation, Applications (solution for some simple cases), Capacitance, Electrostatics energy, Conductor properties, and boundary conditions between dielectric and dielectric-conductor, Uniqueness Theorems. 3. Magneto statics: Biot-savart law, Ampere's circuital law, Curl, Stroke's theorem, Magnetic flux, and magnetic flux density, Energy stored In a magnetic field, Ampere force law, Magnetic vector potential, The analogy between electric and magnetic fields. 4. Maxwell's equations: Equation of Continuity for the time-varying field. Inconsistency of ampere circuital law, Maxwell's equations in differential and integral form. 5. Electromagnetic wave: Solution of the wave equation in free space, Uniform plane wave propagation, Uniform plane waves, the wave equation for conducting medium, Wave propagation in lossless medium and in a conductive medium, Conductors and dielectrics, Polarization.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching electromagnetic theory to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. 3. Contextual Learning: Present the concepts of electromagnetic theory in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate seminars and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of electromagnetic theory learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
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, 5 and 7
	Assignments	2	10% (10)	2, 12	LO # 3, 4, and 6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Current and current density
Week 2	Conductors boundary conditions
Week 3	Dielectrics boundary conditions
Week 4	capacitance
Week 5	Biot savart law
Week 6	Amperes circuital law
Week 7	Mid-term Exam
Week 8	The curl, stokes theorem
Week 9	Magnetic flux and flux density
Week 10	The Lorentz force equation
Week 11	Magnetic materials
Week 12	inductance
Week 13	Time varying fields
Week 14	Eq. for time varying fields
Week 15	Potential energy in magnetic field
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	M. N. O. Sadiku, "Elements of Electromagnetics", 5th Edition, OxfordUniversity Press 2010, ISBN 0195387759, 9780195387759	No
Recommended Texts	W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Edition,TATA Mc Graw Hill, ISBN978007061223	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 Electronics II			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE255**				
ECTS Credits	**5.00**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ECE		**College**	Eng.	
Module Leader	Auda Raheemah Odhaib		**e-mail**	auda@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE 215	**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. Understand the concept of multivibrator devices. 2. Recognize the difference Latches and Flip flops. 3. Apply flip flops in basic applications. 4. Understand the basic operation of counters 5. Recognize the difference synchronous and Asynchronous counters. 6. Determine the sequence of the counters. 7. Learn how to design counters. 9. Identify the basic forms of data movement in shift register 10. Know the different types of shiftt registers and the function of each one of them.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** - Explain the basic differences between Latches and Flip flops. - Use the logic gates to construct basic latch. - Apply flip flops in basic operations. - Determine the modulus of counters. - Modify the modulus of counters. - Determine the sequence of counters. - Design a counter that will have any specified sequence states. - Use the logic gates to decode any given state of a counter. - Explain the various types of shift register. - Explain the applications of shift registers.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. **Introduction to multivibrators:** - bistable devices . - Latch and flip flops. 2. **Application of flip flops:** - frequency division . - counters - Shift registers. 3. **Counters:** - Synchronous and Asynchronous counters - Detrmine the modulus of a counter - The Up/Down counter. - The Cascade counter. - Design counters. 4**. Shift Registers:** - The types of the shift registers. - The bidirectional shift register

	5. **The Shift Register counters :** - The Johnson counter. - The Ring counter 6**. The Shift Register Applications:** - Time Delay. - Serial – to- parallel convertor. - Universal Asynchronous Receiver Transmitter.

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	Here are the strategies that can be employed in teaching digital electronics-II to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

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

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	30% (10)	5, 10	LO #1, 2, 3, 4 and 5
	Assignments	2	10% (10)	2, 12	LO # 5, 6,7,8, 9 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Latches S-R and D latch
Week 2	Flip-flops ., JK , SR, T and D
Week 3	Master slave FF and FF operation
Week 4	Asynchronous counter and modulus
Week 5	synchronous counter
Week 6	Decade Counter
Week 7	Mid-term Exam
Week 8	Design of synchronous counter
Week 9	Cascaded counter and decoding counter
Week 10	Basic shift register SISO
Week 11	SIPO and PISO shift reg.

Week 12	PIPO and bidirectional SR
Week 13	shift register counter
Week 14	shift register counter applications
Week 15	The programmable logic devices (pLD)
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital Fundamental, by Thomas L. Floyed	No
Recommended Texts	digital electronics, principles, devices and applications	No
Websites	https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCA/FY/digielec.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
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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	Technical English Language II			**Module Delivery**	
Module Type	**Support**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UNI002**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	ECE		**College**	Eng.	
Module Leader	Hasanain Atiyah		**e-mail**	hasanainatiayh@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UNI001	**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	- Consider your personal and professional hopes and emption for the future. - Coordinate a job interview and in your area of expertise. - Talk about your favorite story and habits. - Talk about maintaining a heathy lifestyle and give and get advice about healthy habits. - Take part in arbitrations in your area of expertise, if you have help understanding some point. - Discuss polite behavior and respond correctly to impolite behavior.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Learning detailed article on a wide range of subjects and explain a viewpoint. 2. Learning how to deal with a topical issue giving the advantage and disadvantage of various options 3. The students can interact with a degree of fluency and spontaneity that makes regular interaction with B1 English level. 4. Understand the main idea of using the tenses in real life. 5. Can describe experiences and events, dreams, hopes and ambitions. 6. Explain the Synonyms and Antonymous and there can using in their writing. 7. Understand the types of writing. 1. Learning technical discussions in their field of specialization. 2. Learning how to answer and given the emphasis their ideas.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. **Tenses:** - Questions - have/have got. -Expressions of quantity (much/many, some/any, a few/a little and a lot/ lots of) 2. **Verb patterns:** - like doing/would like to do. - will and what…. like? - Comparatives and superlative adjectives 3. **Introduction to model auxiliary verbs:** - have to - Should - Present perfect and past simple -Must

	-Time clauses (first conditional) -Verb patterns 2 4**. The passive:** - Present (Passive and negative) - Past (passive and negative) - present perfect (passive and negative) 5. **Second conditional:** - might (positive and negative) - present perfect continuous 6**. report statements:** - Direct speech - Reported speech

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	Here are the strategies that can be employed in Technical English language II to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	68	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.5
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction and getting to know you
Week 2	The way we live
Week 3	It all went wrong
Week 4	Let's go shopping
Week 5	What do you want to do
Week 6	Tell me what's it like
Week 7	Mid-term Exam
Week 8	Famous couples
Week 9	Do's and don'ts
Week 10	Going places
Week 11	Scared to death
Week 12	Things that changed the world
Week 13	Dreams and reality
Week 14	Earning a living
Week 15	Love you and leave you
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	New Headway pre-intermediate student's Book	yes
Recommended Texts	Series of IELTS booklet, edition by University of Cambridge, 2019, United Kingdom.	No
Websites	English lecturer-free study help, English-literaturer.com.	

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	**ECE311**				
ECTS Credits	**8.00**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	ECE		**College**	College of Engineering	
Module Leader	Abidulkarim K. I. Yasari		**e-mail**	abidulkarim@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None		
Prerequisite 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 signal models, energy signals, and power signals and their relevance to communication engineering. 2. Explain the Fourier Series and its properties, forms, table, and line spectra. Also, understand the Parseval's power theorem. 3. Understand the Fourier Transforms including properties, theorems, pairs, and Fourier Transforms of periodic signals. 4. Explain the power spectral density, correlation functions of energy signals, correlation functions and autocorrelation of power signals, and Rayleigh's energy theorem. 5. Explain LTI systems, linear distortion, ideal filters, and practical filters. 6. Understand the amplitude modulation including DSB modulation, Conventional AM, SSB modulation, Hilbert Transform, the superheterodyne receiver, interference, and noise. 7. Understand the angle modulation, phase, and frequency modulation, spectrum of an angle-modulated signal, Carson's Rule, direct EM generation, indirect FM generation, and demodulation of angle modulated signals. 8. Understand the multiplexing techniques, frequency division multiplexing, stereophonic FM broadcasting, and quadrature multiplexing.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**After successful completion of this module, students will:** 1. Be able to differentiate between signal models and their relevance to communication systems. 2. Be able to represent and transform signals using Fourier Series and Fourier Transform forms, to calculate or represent the power spectral density, correlation and autocorrelation functions of power signals, and Rayleigh's energy theorem. 3. Be able to represent information as time-domain or frequency-domain functions with an understanding of the equivalence between these domains 4. Be able to classify the operation of LTI systems and their distortion, ideal filters, and practical filters. 5. Be able to differentiate between the AM, FM, and Angle modulation, principles, properties, and applications. 6. Be able to represent the multiplexing techniques and their applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Signals and Systems : 1. Communication System 2. Signal Models Fourier Series 1. Fourier series 2. Parseval's power theorem

	3. Fourier series table Fourier Transform 1. Fourier transform pairs Spectral Density and Correlation Functions 1. Rayleigh's energy theorem Linear Systems and Distortion 1. LTI systems 2. Ideal filters 3. Practical filter Continuous-Wave Modulation Systems **1.** Conventional AM **2.** SSB modulation **3.** DSB modulation **4.** The superheterodyne receiver Angle Modulation 1. Phase modulation 2. Frequency modulation Multiplexing Techniques 1. Frequency division multiplexing; 2. Quadrature multiplexing

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching communication systems to the third-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple communication systems concepts, and progressively introduce the design of communication systems. 3. Contextual Learning: Present the concepts of communication systems in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce

	understanding of the fundamentals of communication systems learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**94**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**6.3**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**106**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Signal Models
Week 2	Energy Signals and Power Signals
Week 3	Fourier Series
Week 4	The Fourier Transform
Week 5	Spectral Density and Correlation Functions
Week 6	Linear Systems and Distortion
Week 7	Mid-term Exam
Week 8	Continuous-Wave Modulation Systems: Amplitude Modulation
Week 9	DSB modulation; Conventional AM
Week 10	SSB modulation; Hilbert Transform
Week 11	The superheterodyne receiver; Interference; Noise
Week 12	Angle Modulation: Phase and frequency modulation
Week 13	Spectrum of an angle-modulated signal; Carson's Rule
Week 14	Direct FM generation, Indirect FM generation; Demodulation of angle modulated signals
Week 15	Multiplexing Techniques: Frequency division multiplexing; Stereophonic FM broadcasting; Quadrature multiplexing
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction: Universal Communication Board (UCT-02) and modules
Week 2	EXP-1 TO GENERATE DSB AM WAVE
Week 3	EXP-2 TO RECEIVE DSB AM MODULATED WAVE
Week 4	EXP-3 TO GENERATE SSB AM WAVE
Week 5	EXP-4 TO RECEIVE SSB AM MODULATED WAVE
Week 6	EXP-5 TO STUDY FREQUENCY MODULATION USING VARACTOR MODULATOR
Week 7	Mid- term Exam
Week 8	EXP-6 TO STUDY FREQUENCY MODULATION USING REACTANCE MODULATOR
Week 9	EXP-7 TO STUDY FM DEMODULATION USING DETUNED RESONANT DEMODULATOR CIRCUIT
Week 10	EXP-8 TO STUDY FM DEMODULATION USING QUADRATURE DETECTOR
Week 11	EXP-9 TO STUDY FM DEMODULATION USING PHASE LOCK LOOP (PLL) DETECTOR
Week 12	EXP-10 TO STUDY FM DEMODULATION USING RATIO DETECTOR
Week 13	EXP-11 TO STUDY FM MODULATION USING VCO AND DEMODULATION USING PLL DETECTOR

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Signals and systems, by Alan V. Oppenheim, Alan S. Willsky, with S. Hamid Nawab. - 2nd ed, (ISBN 0-13-814757-4). 2. Data communications and networking, By Behrouz A. Forouzan. - 5th ed.	No
Recommended Texts	Signals, Systems, and Transforms – Fourth Edition, by Charles L. Phillips, John M. Parr, and Eve A. Riskin, (ISBN-13: 978-0-13-198923-8).	No
Websites	https://engineering.mu.edu.iq/?page_id=31977&lang=en	

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	Energy Conversion			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE312**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	ECE		**College**	Eng.	
Module Leader	Aws Hashim Neamah		**e-mail**	aws.hashim@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Understand the concept of magnetic circuit and their relevance to electronics and communication engineering. 2. Explain Flux density, magnetic materials and Inductance as a parameters of energy conversion in magnetic circuits. 3. Study the Transformer principle as an example of energy conversion system. 4. Explain the DC and AC Machines types and operations. 5. Understand the Types of controlled switched and operation principles like gate turn off thyristors , Power MOSFET Diode rectifier, single phase rectifier. 6. Understand the DC-DC converters and inverter and their applications with an Example for Gate derive circuit. 7. Understand the DC-AC inverter and their applications. 8. Understand the concept of Renewable source general (Solar , photovoltaic , wind) and explain renewable energy operation and circuits.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. An ability to apply knowledge of principles of electric machines circuits and power electronics. 2. An ability to conduct the main concepts of Energy conversion. 3. Ability to understand and recognize the variety application of energy conversion such as DC machine , AC machine , DC-DC converter and renewable energy resources. 4. An understanding of professional and ethical responsibility. 5. An education necessary to understand the impact of engineering solution in a global, economic, environmental, and societal context. 6. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Magnetic circuit: • Introduction to magnetic circuits and their role in energy conversion. • Understanding magnetic materials, magnetic fields, and flux. • Calculation and analysis of magnetic circuits using concepts like magnetic permeability and reluctance. 2. Transformer principle: • Explanation of the basic principles of transformers. • Understanding transformer construction and operation. • Analysis of ideal and practical transformers, including

transformer losses and efficiency.

3. DC Machines types:
    - Introduction to different types of DC machines, such as DC generators and DC motors.
    - Understanding the construction and working principles of DC machines.
    - Overview of the main components and characteristics of DC machines.
4. DC Machines operations:
    - Analysis of the operation of DC generators, including the generation of DC voltage.
    - Understanding the operation of DC motors, including torque production and speed control.
    - Calculation of performance parameters like efficiency, power, and voltage regulation.
5. AC Machines types:
    - Introduction to different types of AC machines, such as induction motors, synchronous motors, and alternators.
    - Understanding the construction and working principles of AC machines.
    - Overview of the main components and characteristics of AC machines.
6. AC Machines operations:
    - Analysis of the operation of induction motors, synchronous motors, and alternators.
    - Understanding the torque production, speed control, and synchronization of AC machines.
    - Calculation of performance parameters like power factor, efficiency, and power output.
7. Special Machines - Stepper motor and Servo motor principles and applications:
    - Introduction to stepper motors and servo motors as special types of motors.
    - Understanding the principles of operation and control techniques for stepper motors.
    - Explanation of the principles, feedback systems, and applications of servo motors.
8. Types of controlled switches and operation principles:
    - Overview of different types of controlled switches, such as transistors and thyristors.
    - Explanation of their operation principles and characteristics.
    - Understanding the use of controlled switches in power electronic circuits and energy conversion systems.
9. Diode rectifier and single-phase rectifier:
    - Introduction to diode rectifiers and their role in converting AC

	to DC. • Understanding the operation of single-phase rectifiers, such as half-wave and full-wave rectifiers. • Analysis of rectifier circuits, including voltage and current waveforms, ripple, and efficiency. 10. DC-DC converters and applications: • Overview of DC-DC converters and their role in converting DC voltage levels. • Understanding different types of DC-DC converters, such as buck converters, boost converters, and buck-boost converters. • Application of DC-DC converters in power supplies, battery charging systems, and renewable energy systems. 11. DC-AC inverter principles and applications: • Introduction to DC-AC inverters and their role in converting DC to AC. • Understanding different types of DC-AC inverters, such as square wave, modified sine wave, and pure sine wave inverters. • Application of DC-AC inverters in renewable energy systems, backup power systems, and motor drives. 12. Renewable sources of Energy (Solar, Photovoltaic): • Overview of solar energy as a renewable energy source. • Understanding the principles of photovoltaic (PV) systems for converting solar energy into electricity. • Analysis of PV system components, operation, and applications. 13. Renewable source of Energy (Wind): • Introduction to wind energy as a renewable energy source. • Understanding the principles of wind turbines and wind energy conversion. • Analysis of wind turbine types, characteristics, and power generation.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Energy conversion to third -year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple Magnetic circuit concepts as a basic for energy conversion, and progressively introduce the DC-DC and DC-AC power electronics converters as another term of energy conversion used in renewable energy system and other industrial appliances. 3. Contextual Learning: Present the concepts of energy conversion in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of energy conversion. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	53	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.53
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Magnetic circuit
Week 2	Transformer principle
Week 3	DC Machines types
Week 4	DC Machines operations
Week 5	AC Machines types
Week 6	AC Machines operations
Week 7	Mid-term Exam
Week 8	Special Machines stepper motor and Servo motor principles and applications
Week 9	Types of controlled switched and operation principles
Week 10	Diode rectifier, single phase rectifier
Week 11	DC-DC converters and applications
Week 12	DC-AC inverter principles and applications
Week 13	Renewable source of Energy (Solar , photovoltaic)
Week 14	Renewable source of Energy (wind)
Week 15	Renewable energy operation and circuits
Week 16	**Preparatory week before the final Exam**

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. P. C. SEN	No
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
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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	Electronic III			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE313**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Durgham Al-Shebanee		**e-mail**	durgham.alshebanee@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE212 & ECE222	**Semester**	3,4
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. Have a background on the JFET transistors including the construction and biasing. **2. U**nderstand the construction and physical properties of the depletion-mode MOSFET transistors and Enhancement mode MOSFET transistors. 3. Design of biasing networks of MOSFET circuits including the fixed-bias configuration and self-bias configuration. 4. Understand the small signal model of MOSFET in various applications. 5. Design the single stage amplifiers including the common source amplifiers, source followers, and common gate amplifiers. 6. Analyze the differential amplifiers. 7. Have a background on feedback networks and its basic types. 8. Analyze the high frequency response in MOSFET amplifiers. 9. Understand the Op-Amp basics and specifications. 10. Understand the oscillator circuit and its types. 11. Design of AC/DC converters.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. an ability to apply knowledge of mathematics, science, and engineering, 2. an ability to design an electronic circuit, system, component, or process to meet desired needs within realistic constraints, 3. the ability to function on teams, 4. an ability to identify, formulate, and solve engineering problems, **5.** an understanding of professional and ethical responsibility **6.** an ability to communicate effectively, **7.** an education necessary to understand the impact of engineering solution in a global, economic, environmental, and societal context **8.** an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Indicative Contents المحتويات الإرشادية	1. Construction and Characteristics of JFETs, transfer Characteristics, Important Relationships 2. Depletion-Type MOSFET, Enhancement- Type MOSFET 3. Fixed-Bias Configuration, Self-Bias Configuration 4. Enhancement- type MOSFET Common Source Amplifier MOSFET 5. Common-Gate Configuration, Common-Drain Configuration 6. Differential Amplifier 7. Feedback Configuration, Designing MOSFET Amplifier Networks 8. Frequency Response, Low-Frequency Response, Multistage Frequency Effects 9. High frequency response 10. Op-AMP Basics 11. Op-Amp Specifications 12. Oscillator Operation, Tuned Oscillator Circuit, Crystal Oscillator

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Electronics III to Third-year students: 1. Develop into competent and engaged engineering professionals and apply their technical and managerial qualifications in the planning, designing, constructing, operating, and/or maintaining of the infrastructure concerning the field of electronic and communications engineering. 2. Using their skills to analyze and design systems, identify project execution means and materials, carry out cost estimation and analyses, and participate in directing technical activities for electronic and communications engineering projects or projects related to other fields. 3. Be able to actively participate in their communities and their profession by developing their oral, written, visual and graphic modes communication abilities when working as team members or leaders. 4. Initiate a program of continuous learning which may include studies leading to proficient licensure or a higher degree in engineering that provides continued development of their technical abilities and management skills, and attainment of professional expertise. 5. Improve their understanding of sustainability, professionalism, ethics, quality performance, and safety that allows them to be professional influential to society when solving engineering problems and creating solutions in the field of electronic and communications engineering.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.14
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.86
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 6, and 8
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3hr	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, Important Relationships.
Week 2	Depletion-Type MOSFET, Enhancement- Type MMOSFET
Week 3	Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Biasing
Week 4	Common-Gate Configuration, Depletion Type MOSFET Biasing, Enhancement- type MOSFET Biasing Combination Networks
Week 5	JFET Small-Signal Model, Fixed-Bias Configuration, Self Bias Configuration, Voltage Divider biasing
Week 6	Common-Gate Configuration, Common-Drain Configuration, Depletion-Type MOSFET, Enhancement-Type MOSFETs.
Week 7	Mid-term Exam
Week 8	E-MOSGFET Drain-Feedback Configuration, E-MOSFET Voltage-Divider Configuration. Designing FET Amplifier Networks Cascade Configuration.
Week 9	FET Frequency Response, Low-Frequency, Response of FET, High Frequency Response of FET, Multistage Frequency Effects.
Week 10	Op-AMP Basics, Practical Op-Amp Circuits (Linear Systems)
Week 11	Op-Amp Specifications (DC Offset Regenerative Comparator a Coeamerars (Nealincar Systems).
Week 12	Preciaton AC/DC Converters, Waveform Wien Bridge, Generators, Regenerative Comparator Phase-Shift and Wren Schrait Triege Oecillators.
Week 13	Oscillator Operation, Phase-Shift Oscillator.
Week 14	Wien Beidge Oscillator, Tuned Oscillator Circuit, Crystal Oscillator.
Week 15	FET Frequency Response, Low-Frequency Respanse of FET, High Frequency Response of FET, Multistage Frequency Effects.
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Fundamentals of microelectronics" by Razavi, Behzad.	No
Recommended Texts	"CMOS analog design using all-region MOSFET modeling" by Schneider, Márcio Cherem, and Carlos Galup-Montoro	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	Wave propagation			**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**	Eng.	
Module Leader	Riyadh Dakhil Mansoor		**e-mail**	riyadhdmu@mu.edu.iq	
Module Leader's Acad. Title	Assit Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. To develop an understanding of wave propagation mechanisms. 2. To provide the knowledge of a basic understanding of radio propagation through the application of Maxwell's equations. 3. To illustrate how electromagnetic field theory can be applied to the development of practical design tools such as link budgets 4. To presents fundamental concepts for understanding, evaluating, and predicting radio propagation effects throughout the radio spectrum and in a variety of scenarios.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. Introduce the student to antennas, covering their principles of radiation, their basic parameters, (radiation resistance, radiation pattern, polarization, reciprocity, effective radiated power), their general types, and those commonly used in wireless systems. 2. Quickly analyze a communication link that uses standard antennas and suffers from the various effects of propagation. 3. To reviews Electromagnetic Theory and electromagnetic wave properties. 4. To learn the various propagation mechanisms/impairments and the basic models of propagation. 5. Be able to grasp the idea of link budget analysis and propagation calculations, including antenna gain, efficiency, and directivity calculations; free-space loss; diffraction and obstruction loss; rain loss; depolarization loss; impedance mismatch loss; etc. 6. Determine the range of a wireless RF/microwave system, using what the student knows about propagation mechanisms/impairments and the basic models of propagation to determine approximately the range of a point-to-point system. 7. To learn the various techniques of diversity and combining methods to improve the system performance. 8. Predict propagation effects of electromagnetic waves in the terrestrial, atmosphere, space, and urban environments 9. Describe the statistical characteristics of propagating signals
Indicative Contents المحتويات الإرشادية	1. Understanding the basic principles of wave propagation. 2. Recognizing fundamental parameters of radiations. 3. Overview of wave propagation in different environments. 4. Knowing the basic propagation models and propagation mechanisms/impairments for radio waves. 5. Performing link budget calculations and determining the maximum acceptable path loss. 6. Performing link budget calculations including antenna gain, efficiency and directivity calculations, and propagation mechanisms/impairments losses to expect the maximum range upon the maximum acceptable path loss. 7. Recognizing various techniques of diversity and combining methods to improve the system performance

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching wave propagation courses to third-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students get progress. 3. Contextual Learning: Present the concepts of wave propagation and antenna circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate seminars and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of wave propagation and antenna design learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

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	43	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.86
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Review of electromagnetic theory
Week 2	Hertzian dipole
Week 3	Radiation pattern
Week 4	Beam solid angle
Week 5	Polarization
Week 6	Free space propagation
Week 7	Midcourse exam
Week 8	Ground reflection
Week 9	Midterm exam
Week 10	Surface waves
Week 11	Wave propagation in complex environment
Week 12	Tropospheric propagation
Week 13	Tropospheric scattering
Week 14	Ionospheric propagation
Week 15	Antenna fundamentals
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Antennas and Wave Propagation By: Harish, A.R.; Sachidananda, M. Oxford University Press ISBN: 978-0- 19- 568666- 1/2007	No
Recommended Texts	Antenna Theory: Analysis and Design, 4th edition ISBN: 978-1-118-64206-1	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	Microprocessors			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE315**				
ECTS Credits	**5.00**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	ECE		**College**	Eng.	
Module Leader	Auda Raheemah Odhaib		**e-mail**	auda@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE215 & ECE225	**Semester**	3,4
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 introduces the programming, architecture, and interfacing of the Intel 85x86 microprocessors for the third year students who had previous knowledge in both computer hardware and software. A student, after successfully passing this course will be able to: 1. Understand the main components and working principals of the Intel 85x86 microprocessor 2. Program and debug in assembly language 3. Understand the basic computer architecture 4. Understand the memory organization and memory interfacing 5. Perform input/output device programming in assembly 6. Understand the hardware and software interrupts and their applications. 7. Understand the properties and interfacing of the parallel and serial ports.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Explain the basic differences between digital and analog quantities. 2. Explain the basic logic operations of NOT, AND, and OR. 3. Explain the universal logic gates (NAND and NOR) and use them to implement any combinational logic function. 4. Perform basic arithmetic calculations in binary, octal, decimal, and hexadecimal number systems; 5. Converting between different number systems. 6. Apply the basic Laws and rules of Boolean algebra. 7. Analyze and synthesize combinational logic circuits; 8. Simplification the combinational circuits using Boolean algebra and Karnaugh map. 9. Design basic combinational logic circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. **Introduction to digital concepts:** - Digital and Analog Quantities. - Binary Digits, Logic Levels and Digital waveforms. - Basic Logic Operations. 2. **Number Systems, operations and Codes:** - Decimal numbers, Binary numbers, Octal numbers and Hexadecimal numbers. - Binary Arithmetic - Digital Code and Parity 3. **Logic gates:** - The basic Logic Gates (NOT, AND, OR)

	- The Universal Logic Gates (NAND , NOR) - The Exclusive –OR and Exclusive – NOR gate 4**. Boolean Algebra and Logic Simplification:** - Laws and Rules of Boolean Algebra - DeMorgan's Theorems - Simplification using Boolean Algebra. - Simplification using Karnaugh Map. 5. **Cobinational Logic :** - Basic Combinational Logic circuits. - Implementing Combinational Logic 6**. Functions of Cobinational Logic:** - Adders - Comparators - Decoders and Encoders - Multiplexers and demultiplexers

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction To Microprocessors and Microcomputer
Week 2	Software Architecture Of The 8085 Microprocessor, data type
Week 3	Segment Registers and Memory Segmentation, General purpose register, Status register
Week 4	Generating a memory Address, The Stack, Input/output Address Space
Week 5	Assembly Language Programming, Instruction Set, Addressing mode
Week 6	Machine Language Coding, Encoding A Program
Week 7	Mid-term Exam
Week 8	8085 Programming- Integer Instructions and Computation: Data Transfer Instruction, Arithmetic instruction
Week 9	8085 Programming - Integer Instructions And Computations, Logic Instruction , Shift instruction , Rotate instruction
Week 10	8085 Programming- Control Flow Instructions And Program Structures: Flag Control instruction, Compare and Control Flow Instructions
Week 11	8085 Programming- Control Flow Instructions And Program Structures: Subroutine Handling, Loop, String handling instruction
Week 12	8085 Hardware Specification, Pin Out, Clock Generator, Buffering and Latching
Week 13	Minimum and Maximum Modes, Memory interfacing, Timing
Week 14	Input/output interfacing.
Week 15	I/O Bus Timing and instructions.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab -1: 8085 Microprocessor Training Kit M85-01
Week 2	Lab -2: Introduction to (8085) Microprocessor Principles
Week 3	Lab -3: Hardware Description
Week 4	Lab -4: Keyboard Description
Week 5	Lab -5: Data Transfer Instructions
Week 6	Lab -6: The Arithmetic Instructions
Week 7	Mid- term Exam
Week 8	Lab -7: The Logical Instructions
Week 9	Lab -8 : Branching & Decision Masking
Week 10	Lab -9 : Applications examples 1
Week 11	Lab -10 : Applications examples 2

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Digital Fundamental, by Thomas L. Floyed	No
Recommended Texts	digital electronics, principles, devices and applications	No
Websites	https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCA/FY/digielec.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	**Engineering Statistics and Probability**			**Module Delivery**	
Module Type	**Basic**			☐ **Theory** ☒ **Lecture** **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ENG004**				
ECTS Credits	**4.00**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Ahmed Hasan Saaudi		**e-mail**	Ahmed.saaudi@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Learn the language and core concepts of probability theory. 2. Understand basic principles of statistical inference (both Bayesian and frequentist). 3. Build a starter statistical toolbox with appreciation for both the utility and limitations of these techniques. 4. Use software and simulation to do statistics (R). 5. Become an informed consumer of statistical information. 6. Prepare for further coursework or on-the-job study.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Use basic counting techniques (multiplication rule, combinations, permutations) to compute probability and odds. 2. Use R to run basic simulations of probabilistic scenarios. 3. Compute conditional probabilities directly and using Bayes' theorem, and check for independence of events. 4. Set up and work with discrete random variables. In particular, understand the Bernoulli, binomial, geometric and Poisson distributions. 5. Work with continuous random variables. In particular, know the properties of uniform, normal and exponential distributions. 6. Know what expectation and variance mean and be able to compute them. 7. Understand the law of large numbers and the central limit theorem. 8. Compute the covariance and correlation between jointly distributed variables. 9. Use available resources (the internet or books) to learn about and use other distributions as they arise.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: **1- Probability:** (uncertain world, perfect knowledge of the uncertainty) • Counting • Random variables, distributions, quantiles, mean variance • Conditional probability, Bayes' theorem, base rate fallacy • Joint distributions, covariance, correlation, independence • Central limit theorem **Statistics I: pure applied probability** (data in an uncertain world, perfect knowledge of the uncertainty) • Bayesian inference with known priors, probability intervals • Conjugate priors **Statistics II: applied probability** (data in an uncertain world, imperfect knowledge of the uncertainty) • Bayesian inference with unknown priors • Frequentist significance tests and confidence intervals • Resampling methods: bootstrapping • Linear regression

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	53	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.53
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	30% (10)	5, 10	LO #1, 2, 3,4
	Assignments	2	10% (10)	2, 12	LO # 5,6,7,8,9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Sample Spaces and Events
Week 2	Interpretations and Axioms of Probability, Addition Rules, Conditional Probability
Week 3	Multipretation and Total, Probability Rules, Independence, Bayes' Theorem, Random Variable
Week 4	Discrete Random Variables, Probability Distribution and Probability Mass Functions, Cumulative Distribution Functions.
Week 5	Mean and Variance of a Discrete Random Variable, Discrete Uniform Distribution
Week 6	Binomial Distribution, Poisson Distribution
Week 7	Mid-term Exam
Week 8	Continuous Random Variables, Probability Distribution and Probability Density Functions, Cumulative Distribution Functions
Week 9	Mean and Variance of a Continuous Random Variable, Continuous Uniform Distribution
Week 10	Normal Distribution, Normal approximation to the Binomial and Poisson Distribution
Week 11	Exponential Distribution, Erlang and Gamma Distribution
Week 12	Joint Probability Distribution, Marginal Probability Distribution, conditional Probability Distribution, Independence
Week 13	Covariance and Correlation, Moment Generating Functions
Week 14	Descriptive Statistics, Numerical Summaries of Data, Stem-and- Loaf Diagrams
Week 15	Frequency Distribution and Histograms, Box Plots, Time Sequence Diagrams
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	R.B. Ash and C.A. Dol´eans-Dade. (2000). Probability and Measure Theory, 2nd Ed. Academic Press.	No
Recommended Texts	The Elements of Statistical Learning Data Mining, Inference, and Prediction, Second Edition by Trevor Hastie	No
Websites	https://ocw.mit.edu/courses/1-151-probability-and-statistics-in-engineering-spring-2005/pages/lecture-notes/	

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	**ECE321**				
ECTS Credits	**8.00**				
SWL (hr/sem)	**200**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	ECE		**College**	Eng.	
Module Leader	Abidulkarim K. I. Yasari		**e-mail**	abidulkarim@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE311	**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. Understand the concept of Digital-to-Analog Conversion: Data Element Versus Signal Element, Data Rate Versus Signal Rate, Bandwidth, Carrier Signal. 2. Explain the Digital Transmission of Analog Signals: Sampling Theorem and its applications. 3. Understand the principles and applications of the PAM, PWM, PPM (Modulation and Demodulation). 4. Understand the concept of the QAM (Modulation and Demodulation), and Multidimensional Signaling 5. Understand the power Signaling Schemes with Memory: CPFSK, and CPM. Also, the Digital Representation of Analog Signals, and Pulse Code Modulation (PCM). 6. Explain the PCM System applications in digital transmission, the Time Division Multiplexing, and TDM Hierarchy. 7. Understand the principles of Multicarrier Modulation and OFDM. 8. Understand the Digital-to-digital conversion techniques such as line coding, block coding, and scrambling. 9. Understand the concepts of the Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, and Voice Coders. 10. Explain the Phase-Shift Keying, Frequency-Shift Keying, Amplitude-Shift Keying, QASK, QFSK, and QPSK modulation techniques and their applications. 11. Explain the concepts of Emerging digital communication technologies such as AI, ML, Blockchain, Web3 technology, Intelligent automation and robotic process automation (RPA), Internet of things (IoT), and Quantum computing. 12. Understand the concept of the Quality of Service (QoS), and explain its main parameters such as the Delay, Reliability, and Jitter.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**After successful completion of this module, students will:** 1. Be able to use or apply the Digital-to-Analog Conversion techniques to analyze or design a communication system with specific parameters such as the Data Rate, Signal Rate, Bandwidth, and Carrier Signal. 2. Be able to represent the Digital Transmission of Analog Signals using the Sampling Theorem and its applications. 3. Be able to represent the concepts, principles, and applications of the PAM, PWM, PPM, QAM (Modulation and Demodulation), and Multidimensional Signaling techniques. 4. Be able to represent the power Signaling Schemes with Memory such as CPFSK, and CPM. Also, the Digital Representation of Analog Signals, and Pulse Code Modulation (PCM) in digital transmission including the TDM and TDM Hierarchy. 5. Be able to analyze and design the Multicarrier Modulation and OFDM systems. 6. Be able to represent the Digital-to-digital conversion techniques such as line coding, block coding, and scrambling. 7. Be able to represent the concepts of the Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, and Voice

	Coders. 8. Be able to represent the Phase-Shift Keying, Frequency-Shift Keying, Amplitude-Shift Keying, QASK, QFSK, and QPSK modulation techniques and their applications. 9. Be able to represent the concepts of Emerging digital communication technologies such as AI, ML, Blockchain, Web3 technology, Intelligent automation and robotic process automation (RPA), Internet of things (IoT), and Quantum computing. 10. Be able to analyze the communication systems based on the Quality of Service (QoS), and calculate their main parameters such as the Delay, Reliability, and Jitter.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Sampling Theorem 2. Pulse Amplitude Modulation 3. Pulse Width Modulation 4. Pulse Position Modulation 5. Quadrature Amplitude Modulation 6. Pulse Code Modulation 7. TDM communication system 8. OFDM communication system 9. Delta modulation 10. Phase-Shift Keying, Frequency-Shift Keying, Amplitude-Shift Keying, QASK, QFSK, and QPSK. 11. Emerging digital communication technologies

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching communication systems to the third-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple communication systems concepts, and progressively introduce the design of communication systems. 3. Contextual Learning: Present the concepts of communication systems in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of communication systems learning. 5. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**94**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**6.2**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**106**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7**
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 4, 6, and 8
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Aspects of Digital-to-Analog Conversion
Week 2	Digital Transmission of Analog Signals
Week 3	Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation (generation and Demodulation).
Week 4	Quadrature Amplitude Modulation (generation and Demodulation). Multidimensional Signaling.
Week 5	Signaling Schemes with Memory: CPFSK, and CPM.
Week 6	Digital Representation of Analog Signals, Pulse Code Modulation (PCM), Data transmission and modes.
Week 7	Mid-term Exam
Week 8	PCM System Issues in digital transmission: Time Division Multiplexing, TDM Hierarchy
Week 9	Multicarrier Modulation and OFDM
Week 10	Digital-to-digital conversion: line coding, block coding, and scrambling.
Week 11	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders.
Week 12	Phase-Shift Keying, Frequency-Shift Keying, Amplitude-Shift Keying, QASK, QFSK, and QPSK.

Week 13	Emerging digital communication technologies: Artificial intelligence (AI) and machine learning (ML), Blockchain and Web3 technology, Intelligent automation and robotic process automation (RPA).
Week 14	Emerging digital communication technologies: Internet of things (IoT), Quantum computing.
Week 15	Quality of Service (QoS)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	EXP-1 STUDY OF PAM AND ITS DEMODULATION USING NATURAL SAMPLING
Week 2	EXP-2 STUDY OF PAM AND ITS DEMODULATION USING FLAT TOP SAMPLING
Week 3	EXP-3 STUDY OF PWM AND ITS DEMODULATION USING NATURAL & FLAT TOP SAMPLING
Week 4	EXP-4 STUDY OF PPM AND ITS DEMODULATION USING NATURAL & FLAT TOP SAMPLING
Week 5	EXP-5 STUDY OF TDM PULSE AMPLITUDE MODULATION AND DEMODULATION
Week 6	EXP-6 SAMPLING AND MULTIPLEXING TECHNIQUES OF ANALOG SIGNAL. ITS PULSE CODE MODULATION IN NONE PARITY MODE AND THE RECONSTRUCTION OF THE SIGNAL
Week 7	Mid- term Exam
Week 8	EXP-7 TO STUDY DATA CODING AND DECODING TECHNIQUES FOR RETURN TO ZERO FORMAT AND MULTILEVEL BINARY FORMAT
Week 9	EXP-8 TO STUDY UNIPOLAR TO BIPOLAR AND BIPOLAR TO UNIPOLAR CONVERSION
Week 10	EXP-9 TO STUDY AMPLITUDE SHIFT KEYING MODULATION & DEMODULATION TECHNIQUES
Week 11	EXP-10 TO STUDY FREQUENCY SHIFT KEYING MODULATION & DEMODULATION TECHNIQUES
Week 12	EXP-11 TO STUDY PHASE SHIFT KEYING MODULATION & DEMODULATION TECHNIQUES
Week 13	EXP-12 TO STUDY DELTA MODULATION & DEMODULATION TECHNIQUES

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Data communications and networking, By Behrouz A. Forouzan. - 5th ed.	No
Recommended Texts	Introduction to Analog and Digital Communications, By Simon Haykin, and Michael Moher. – 2nd ed.	No
Websites	https://engineering.mu.edu.iq/?page_id=31977&lang=en	

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	**Basic**			☐ **Theory** ☒ **Lecture** **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE322**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	ECE		**College**	Eng.	
Module Leader	Ahmed Hasan Saaudi		**e-mail**	Ahmed.saaudi@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ENG004	**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. Introduce information theory • Probabilistic (stochastic) systems • Reasoning under uncertainty • Quantifying information • State and discuss coding theorems 2. Give an overview of coding theory and practice • Data compression • Error-control coding • Automatic learning and data mining 3. Illustrate ideas with a large range of practical applications The course aims at introducing information theory and the practical aspects of data compression and error-control coding. The theoretical concepts are illustrated using practical examples related to the effective storage and transmission of digital and analog data. More broadly, the goal of the course is to introduce the basic techniques for reasoning under uncertainty as well as the computational and graphical tools which are broadly used in this area. In particular, Bayesian networks and decision trees will be introduced, as well as elements of automatic learning and data mining. The theoretical course provides a series of computer laboratories, in which the students can simulate data sources, data transmission channels, and use various software tools for data compression, error-correction, probabilistic reasoning and data mining. The course is addressed to engineering students (last year), which have some background in computer science, general mathematics and elementary probability theory.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	On successful completion of this course, students will be able to: 1. Overview of Probability Theory, significance of "Information" with respect to Information Theory. 2. Derive equations for entropy, mutual information and channel capacity for all kinds of channels. 3. Understand various types of source coding algorithms and analyze their performance. 4. Explain various methods of generating and detecting different types of error correcting codes 4. Understand the fundamentals of Field Theory and polynomial arithmetic 5. Design linear block codes and cyclic codes (encoding and

	decoding). 6. Understand and decode a sequence at the receiver 7. Perform mathematical analysis of problems in Information Theory and Coding 8. Use available resources (the internet or books) to learn about and use other distributions as they arise.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: 1. Review of Mathematical Background and Basic Concepts in Probability Theory. 2. Introduction of Information Measures and their Properties: Entropy; Mutual Information; Conditional Entropy; Conditional Mutual Information; Kullback-Leibler Divergence; Log-sum inequality; Data Processing Inequality; Fano's inequality. 3. Asymptotic Equipartition Property (AEP): Law of Large Numbers; Types and Typicality. 4. Lossless source coding theorem and algorithms. 5. Noisy Channel Models and Shannon's Channel Coding Theorem. 6. Fundamentals of Linear Codes: Introduction to Error Detection and Correction; Types of Codes; Minimum Distance. 7. Block Coding Principles: Generator Matrix Description, Systematic Codes, Detection and Correction Bounds. 8. Convolutional Codes (Encoding): encoders; generator polynomials; constraint length; state diagrams; tree and trellis diagrams; distance measures. 9. Convolutional Codes (Decoding): Viterbi algorithm; Soft-Decision Decoding; MAP Decoding. LDPC Codes: Code Density, Tanner Graphs, Belief Propagation. 10. Special topics: Network Coding and Digital Fountain.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.2
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	30% (10)	5, 10	LO #1, 2, 3,4
	Assignments	2	10% (10)	2, 12	LO # 5,6,7,8,9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Review of probability theory and random variables**, Chance Experiments and Events; what is probability; Conditional
Week 2	Random variables; Cumulative Distribution Function; probability Density Function; Joint; Marginal and Conditional probability Functions;
Week 3	Transformation of Random Variables; statistical Averages; Standard probability Distribution
Week 4	**Information Modeling and Source Coding** Uncertainty and Information; the Discrete Memory less Source; Information Content of a Symbol; The Entropy of a DMS
Week 5	Source Coding; Kraft Inequality; Source Coding Theorem; Coding Efficiency and Redundancy; Conditional and Mutual Information
Week 6	Conditional Entropy and Average Mutual Information; Entropy Kate; Differential Entropy.
Week 7	**Source Coding Techniques** Digital communications; Source Coding Theorem; Huffman Coding; Source Extension
Week 8	Mid-term Exam
Week 9	Shannon-Fano Coding; Arithmetic Coding
Week 10	Run-Length Encoding (RLE); Lempel-Ziv Encoding (L.Z)
Week 11	**Modeling and Capacity** Discrete Channel Models; Special Channel Models; Cascaded Discrete Channels
Week 12	Discrete Channel Capacity; Gaussian Channel Capacity; The Shannon ; The Channel Coding Theorem
Week 13	**Channel Coding Techniques** Channel Coding; Error Control Coding; Basic Definition
Week 14	Single-Parity Check Code; Repletion Codes;
Week 15	Error-Correction Parity Check Codes; Hamming codes
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Cover, Thomas M. 2006, Elements of Information Theory, 2nd, Wiley-Interscience.	No
Recommended Texts	Lin, Shu; Costello, D. J. 2004, Error Control Coding, 2nd, Prentice-Hall, New Jersey	No
Websites	https://www.tutorialspoint.com/principles_of_communication/principles_of_communication_information_theory.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	Antenna			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE323**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	ECE		**College**	Eng.	
Module Leader	Riyadh Dakhil Mansoor		**e-mail**	riyadhdmu@mu.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE214 & ECE224 & ECE314	**Semester**	5,6,7
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. To develop an understanding of various types of antenna radiation mechanism. 2. To provide the knowledge of basic understanding of antenna operation through the application of Maxwell's equations. 3. To illustrates how electromagnetic field theory can be applied to the development of practical design tools such as link budgets 4. To presents fundamental concepts for understanding, evaluating, and predicting radio propagation effects throughout the radio spectrum and in a variety of scenarios.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. Introduce the student to antennas, covering their principles of radiation, their basic parameters, (radiation resistance, radiation pattern, polarization, reciprocity, effective radiated power), their general types, and those commonly used in wireless systems. 2. Quickly analyze a communication link that uses standard antennas and suffers from the various effects of propagation. 3. To reviews Electromagnetic Theory and electromagnetic wave properties. 4. To learn the various propagation mechanisms/impairments and the basic models of propagation. 5. Be able to grasp the idea of link budget analysis and propagation calculations, including antenna gain, efficiency, and directivity calculations; free-space loss; diffraction and obstruction loss; rain loss; depolarization loss; impedance mismatch loss; etc. 6. Determine the range of a wireless RF/microwave system, using what the student knows about propagation mechanisms/impairments and the basic models of propagation to determine approximately the range of a point-to-point system. 7. To learn the various techniques of diversity and combining methods to improve the system performance. 8. Predict propagation effects of electromagnetic waves in the terrestrial, atmosphere, space, and urban environments 9. Describe the statistical characteristics of propagating signals
Indicative Contents المحتويات الإرشادية	Indicative contents contain the following 1. Understanding the basic principles and radiation of antennas. 2. Recognizing fundamental parameters of antennas. 3. Overview of antenna types and applications in wireless systems. 4. Knowing the basic propagation models and propagation mechanisms/impairments for radio waves. 5. Performing link budget calculations and determining the maximum acceptable path loss. 6. Performing link budget calculations including antenna gain, efficiency and directivity calculations, and propagation mechanisms/impairments losses to expect the maximum range upon the maximum acceptable path loss. 7. Recognizing various techniques of diversity and combining methods to improve the system performance

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Antenna courses to third-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students get progress. 3. Contextual Learning: Present the concepts of wave propagation and antenna circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate seminars and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of wave propagation and antenna design learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	103	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.86
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Antenna fundamentals
Week 2	Effective aperture
Week 3	bandwidth
Week 4	Beam solid angle
Week 5	Wire antenna
Week 6	Aperture antenna
Week 7	Midcourse exam
Week 8	Antenna array
Week 9	Special antenna
Week 10	Monopole and dipole antenna
Week 11	Yagi-uda antenna
Week 12	Biconical antenna
Week 13	Log periodic dipole array
Week 14	Spiral antenna
Week 15	Review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Antennas and Wave Propagation By: Harish, A.R.; Sachidananda, M. Oxford University Press ISBN: 978-0- 19- 568666- 1/2007	No
Recommended Texts	Antenna Theory: Analysis and Design, 4th edition ISBN: 978-1-118-64206-1	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	**Core**			☐ **Theory** ☒ **Lecture** **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE324**				
ECTS Credits	**4.00**				
SWL (hr/sem)	**100**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	ECE		**College**	Eng.	
Module Leader	Ahmed Hasan Saaudi		**e-mail**	Ahmed.saaudi@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE215 & ECE225 & ECE315	**Semester**	3,4,5
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This course aims to give an understanding of the mechanisms for implementing the programmer's idealized computer. It builds on the introduction to hardware and to simple processors in the Digital Systems course. The Computer Architecture course aims to describe a broad range of architectural designs and to contrast them, highlighting the design decisions they incorporate, and how these design decisions impact program performance.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**On successful completion of this course, students will be able to:** 1. Understand the major architectural styles and appreciate the compromises that they encapsulate. 2. Able to read outline descriptions of real processors and understand in which way their designs fit into the frameworks described in the course. 3. Able to understand the impact of design choices in programming in the context of a specific architecture.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: **Unit 1: Computer Architecture** **(i) Micro Computer Architecture:** CPU, Memory, I/O Devices and Interfaces, System Bus, Examples of CPU Structures, The Intel / Pentium CPU, Machine Language Instructions, Instruction Formats and Addressing Modes. **(ii) The Processing Elements:** Macroinstruction execution, Internal Bus Transfers, Detailed Internal Architecture, Microcontrol, Hard-wired Control, Microprogrammed Control, Reduced Instruction Set Computers. **(iii) I/O Programming:** Programmed I/O, Interrupt I/O, Polling, Priority Interrupt System, Direct Memory Access, I/O processors. Memory Systems and Memory Management: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching digital electronics to second-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple digital electronics concepts and number systems, and progressively introduce to the design of simple logic gates. 3. Contextual Learning: Present the concepts of digital combinational circuits in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of digital electronics learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	53	**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	30% (10)	5, 10	LO #1, 2,
	Assignments	2	10% (10)	2, 12	LO # 2, 3
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-3
	Final Exam	3hr	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 A View of Computer Function and Interconnection
Week 5	Memory Interfacing, Advance DRAM Organization
Week 6	Cache Memory principles and elements of cache design
Week 7	Mid-term Exam
Week 8	Computer Memory System: External memory, Hard disk, optical disks
Week 9	Mid-term Exam
Week 10	Computer Architecture: Integer representation and arithmetic, Addition and Subtraction, Division and multiplication
Week 11	Computer architecture Floating Point representation, Floating-Point arithmetic
Week 12	introduction to pipelining, instruction pipelining, instruction level parallelism and superscalar processor
Week 13	control unit operation, the instruction cycle, control unit logic (hard wired implementation)
Week 14	Microprogramming control : organization of control memory, microinstruction execution
Week 15	Microprogramming control : Microinstruction execution
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital Fundamental, by Thomas L. Floyed	No
Recommended Texts	digital electronics, principles, devices and applications	No
Websites	https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCA/FY/digielec.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	Numerical analysis			**Module Delivery**	
Module Type	**Basic**			**Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE325**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Moneer Ali lilo		**e-mail**	moneerlilo@mu.edu.iq	
Module Leader's Acad. Title	Assistance Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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	The aims of teaching and learning mathematics are to encourage and enable students to: - to a broad range of numerical methods for solving mathematical problems that arise in Science and Engineering. - The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods, along with a rudimentary understanding of finite precision arithmetic and the conditioning and stability of the various problems and methods. - This will help you choose, develop and apply the appropriate numerical techniques for your problem, interpret the results, and assess accuracy. The problems cover (i) systems of linear equations, linear least squares problems, and eigenvalue calculation. (ii) Interpolation, approximation, and integration of functions. (iii) Initial values problems governed by ordinary differential equations. (iv) Nonlinear scalar equations.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	**Students are required to apply advance mathematical skills to resolve engineering problems based on numerical methods to:** 1. analysis the solution to engineering problems. 2. use standard numerical analysis symbols, layouts and annotation 3. selecting appropriate numerical theories to evaluate engineering solutions for the experiment applications 4. selecting and applying standard numerical theories and methods to address real-world engineering problems 5. use methods of communicating numerical theories, including formulas, tables and graphs 6. fitting and analyses data based on numerical theories
Indicative Contents المحتويات الإرشادية	1- Introduction to numerical analysis - Samples about numerical analysis applications 2- Computer calculation and error analysis - Accuracy and error for the mathematical applications 3- Numerical solution of simultaneous linear and nonlinear equations - Direct methods - Indirect methods - Simple iterative methods 4- Root of equation finding methods (Newton-Raphson) - Square root - Root of any arbitrary order

	- The reciprocal of any number 5- Solution of polynomial equations 6- Curve fitting - Least – squarer regression - Linearization of nonlinear relationship 7- Solve many examples and write the main equations for each topic

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching numerical analysis to third -year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffold Instruction: Provide structured support and gradually increase the difficulty level as students' progress. Start with simple applications of numerical analysis concepts and number analysis. 3. Contextual Learning: Present the concepts of numerical analysis in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate hands-on activities and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of mathematic learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	81	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.4
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, 3,and 4
	Assignments	2	10% (10)	2, 12	LO # 4, 5, and 6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to numerical analysis
Week 2	Computer calculation and error analysis
Week 3	Numerical solution of simultaneous linear equations
Week 4	Numerical solution of simultaneous nonlinear equations
Week 5	Root of equation finding methods (iterative, mean value)
Week 6	Root of equation finding methods (Newton-Raphson)
Week 7	Root of equation finding methods (false-positive, bisection)
Week 8	Exam I
Week 9	Solution o polynomial equations
Week 10	Solution o polynomial equations
Week 11	The interpolation polynomial
Week 12	Curve fitting

Week 13	Polynomial fit
Week 14	Numerical integration
Week 15	Numerical differentiation
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	mathematic, by Thomas L.	No
Recommended Texts	Thomas-calculus	No
Websites	http://dl.konkur.in/post/Book/Paye/Thomas-Calculus-14th-Edition-%5Bkonkur.in%5D.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	Microwave engineering			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE412**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Riyadh Dakhil Mansoor		**e-mail**	riyadhdmu@mu.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE214 & ECE224	**Semester**	4 , 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. to provide an understanding of microwave waveguides, passive & active devices, tubes , and network analysis. 2. to enhance the ability to design microwave matching networks. 3. Increase the ability to perform microwave measurements. 4. An understanding of RADARs and its applications.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. Explain different types of waveguides and their respective modes of propagation. 2. Analyze typical microwave networks using impedance, admittance, transmission and scattering matrix representations. 3. Design microwave matching networks using L section, single and double stu and quarter wave transformer. 4. Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc. 5. Describe and explain working of microwave tubes and solid state devices. 6. Perform measurements on microwave devices and networks using power meter and VNA. 7. Explain the operation of RADAR systems and recite their applications. 8. Describe the statistical characteristics of propagating signals
Indicative Contents المحتويات الإرشادية	Indicative contents contain the following 1. Review of Transmission lines: Distributed elements concept, Telegrapher's equations, lossless and lossy lines, line impedance and junction, Smith Chart. General solutions for TEM, TE and TM waves. 2. Waveguides: Rectangular, circular, coaxial cable and modes of propagation. Introduction to stripline and microstripline. 3. Microwave networks: N-port microwave networks, impedance, admittance, transmission and scattering matrix representations, reciprocal and lossless networks, network matrices transformations. 4. Impedance matching and tuning: L-section impedance matching, single and double stub matching, Quarter wave transformer. 5. Microwave passive circuits: Waveguide cavity resonators. Principles of E-plane Tee, Hplane Tee, hybrid Tee, isolator, circulator, directional couplers, attenuators and phase shifters. Microstrip: Design of Wilkinson power divider

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Microwave engineering courses to fourth-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students get progress. 3. Contextual Learning: Present the concepts of MW engineering in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate seminars and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of MW engineering design learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	103	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	TEM waves in parallel plate waveguides
Week 2	TE/TM waves on a parallel plate waveguide
Week 3	Power flow and attenuation on PP-WG
Week 4	Rectangular waveguide partially filled rectangular waveguide circular waveguides
Week 5	Coaxial transmission line
Week 6	Grounded dielectric slab and surface waves
Week 7	Midcourse exam
Week 8	Strip line and microstrip line
Week 9	Impedance/ admittance / scattering matrices
Week 10	Generalized scattering parameters
Week 11	Microwave resonators
Week 12	Power dividers and directional couplers
Week 13	Ferrimagnetic materials
Week 14	Microwave power sources
Week 15	Review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	D. M. Pozar; Microwave Engineering, 3rd Ed.; John Wiley & Sons Inc	No
Recommended Texts	H.J.Reich, J.G.Skolnik, P.F.Ordung, H.L.Krauss; Microwave Principles; Affiliated East West Press Ltd.	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			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE413**				
ECTS Credits	**7.00**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	-		**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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. Identify the signals and systems. 2. Apply the principles of discrete-time signal analysis to perform various signal operations. 3. Apply the principles of z-transforms to finite difference equations. 4. Apply the principles of Fourier transform analysis to describe the frequency characteristics of discrete-time signals and systems. 5. Apply the principles of signal analysis to filtering. 6. Use computer programming tools to process and visualize signals.
Module Learning Outcomes (LO) 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	1. Classification of discrete-time signals and systems, convolution 2. Discrete-time Fourier transform 3. LTI systems, Impulse response and frequency response 4. Finite difference equations, and z transforms. 5. Sampling of continuous-time signals. 6. Digital filter structures block diagrams, signal flow-graphs, and basic FIR digital filter structures. 7. Ideal filters, FIR and IIR filters filter design. . 8. Discrete Fourier transforms.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Digital Signal Processing (DSP) to fourth-year students: 1. Develop into competent and engaged engineering professionals and apply their technical and managerial qualifications in the planning, designing, constructing, operating, and/or maintaining of the infrastructure concerning the field of electronic and communications engineering. 2. Using their skills to analyze and design systems, identify project execution means and materials, carry out cost estimation and analyses, and participate in directing technical activities for electronic and communications engineering projects or projects related to other fields. 3. Be able to actively participate in their communities and their profession by developing their oral, written, visual and graphic modes communication abilities when working as team members or leaders. 4. Initiate a program of continuous learning which may include studies leading to proficient licensure or a higher degree in engineering that provides continued development of their technical abilities and management skills, and attainment of professional expertise. 5. Improve their understanding of sustainability, professionalism, ethics, quality performance, and safety that allows them to be professional influential to society when solving engineering problems and creating solutions in the field of electronic and communications engineering.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	113	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.53
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 6, and 8
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Signals, Systems and Signal Processing, Types of Signals, The Concepts of Frequency in Continuous and Discrete Time Signals.
Week 2	Sampling of Analogue Signals, Discrete Time Signals, Classification & Manipulation, Discrete Time Systems, Input/output discerption, Classifications & Interconnection.
Week 3	Analysis of Discrete Time LTI systems, Resolution of Discrete Time Signals into impulses, Response of LTI systems to Arbitrary input,
Week 4	Convolution Sum , Properties of Convolution, Interconnection of LTI systems, Casual LTI systems, Stability, systems with Finite – Duration and infinite Duration
Week 5	Recursive and non-recursive Discrete Time Systems, Discrete Time Systems Describe by Difference Equations, Solution of Linear Constant-Coefficient Difference Equations.
Week 6	Impulse Response of LTI Recursive systems, Structures for the Realization of LTI systems, Correlation of Discrete Time Signals, Properties of Autocorrelation and Cross correlation Sequence, Correlation of Periodic Signals, Input/output Correlation Sequence.
Week 7	Mid-term Exam
Week 8	The Z-Transform, Inversion Method of Z-Transform
Week 9	Solution of Difference Equations, Analysis of LTI system in Z-Transform.,
Week 10	The Fourier Series of Discrete -Time Periodic Signals (DTFS), Power Density Spectrum of Periodic Signals.
Week 11	The Discrete -Time Fourier Transform (DTFT) for Periodic Signals and its Convergence, Energy Density Spectrum of Periodic Signals, Relationship of DTFT to Z-Transform, Theorems and Properties of DTFT, Symmetry Properties.
Week 12	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 13	Frequency Response of LTI Systems, Computation of the Frequency Response Functions & Geometric Interpretation of Poles and Zeros,
Week 14	The Discrete Fourier Transform (DFT), Frequency Domain and Sampling and Reconstruction of Discrete -Time Signals, 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.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	S. Orfanidis *Introduction to Signal Processing* URL: http://www.ece.rutgers.edu/~orfanidi/intro2sp/	No
Recommended Texts	D. Manolakis and V. Ingle *Applied Digital Signal Processing*, 2nd Edition Cambridge University Press (1st Edition) November 21, 2011, 1008 pages ISBN: 978-0521110020 URL: Applied Digital Signal Processing (1st Edition) A. Oppenheim and R. Shaffer *Discrete-time Signal Processing*, 3rd Edition Prentice-Hall August 28, 2009, 1120 pages ISBN: 978-0131988422 URL: Discrete-time Signal Processing (3rd Edition) J. G. Proakis and D. G. Manolakis *Digital Signal Processing: Principles, Algorithms, and Applications* Prentice-Hall April 7, 2006, 1006 pages URL: Digital Signal Processing: Principles, Algorithms, and Applications (4th Edition)	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 System Design**			**Module Delivery**	
Module Type	**Basic**			**Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE414**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Electronic& Communications		**College**	Eng.	
Module Leader	Moneer Ali lilo		**e-mail**	moneerlilo@mu.edu.iq	
Module Leader's Acad. Title	Assistance Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE215 & ECE225 & ECE315	**Semester**	3,4,5
Co-requisites module	none	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**Subject content aims:** 1. Transform students into engineers, capable of designing and implementing complex digital systems. 2. Use a hardware description Language (VHDL) 3. Implement with multiple existing integrated circuits 4. Be able to design and analyze combinational logic circuits. 5. Be able to design and analyze sequential logic circuits. 6. Understand the basic software tools for the design and implementation of digital circuits and systems. 7. Reinforce theory and techniques taught in the classroom through experiments and projects in the laboratory.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	Subject content learning outcomes 1. Understanding the principles and making design of ADC & DAC circuits. 2. Designing sequence generators with applications. 3. Making analysis & design for synchronous and asynchronous state machines 4. Understanding implementation of semiconductor memory circuits and PLDs 5. Understanding principles and characteristics of different logic families. 6. Hardware designing of microcomputers. 7. Developing design methods for digital systems. 8. Deciding which type of logic families is proper for specific digital systems design. 9. Making oral scientific presentations
Indicative Contents المحتويات الإرشادية	1. The course will focus on types of Input/output of digital system • Input/output Handshaking and Parallel Interfacing 2. After that will monitor the 82C55A Programmable Peripheral interface. • 82C55A Implementation of Parallel I/O Ports, 3. Other MC will be the 82C54 Programmable Interval timer 4. The digital system need the communicated with other system by Serial Communications Interface and Programmable Communication 5. Interrupt Mechanism so important for the digital system design • External hardware Interrupt interface and Interrupt Sequence

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. **Implementation and testing of the data path**. The task is to model in VHDL, synthesize, and validate all blocks of the data path by simulation, trying to create parameterizable components, as this will facilitate future adjustments to the system 2. **Implementation and testing of the control unit**. Students are requested to complete the control unit, and then to specify in VHDL and to validate the control unit by simulation 3. **Interconnection and test** of the complete processor (datapath + control unit). Interconnection of the control unit and the datapath has to be provided and the entire systems has to be tested in a simulator 4. **Adding a new instruction.** At this point, the students are asked to add a new type II instruction, such as BEQ (branch on equal) or BNE (branch on not equal).

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	103	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.86
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, 3,and 4
	Assignments	2	10% (10)	2, 12	LO # 4, 5, and 6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Types of Input/output (I/O), Isolated I/O Interface, I/O data transfer and Instructions
Week 2	Byte-wide output ports using Isolated I/O and Byte-wide input ports using Isolated I/O
Week 3	Input/output Handshaking and Parallel Interfacing
Week 4	82C55A Programmable Peripheral interface.
Week 5	82C55A Implementation of Parallel I/O Ports, Memory Mapped I/O Ports.
Week 6	82C54 Programmable Interval timer.
Week 7	Exam I
Week 8	82C37 Programmable Direct Memory Access controller.
Week 9	Serial Communications Interface and Programmable Communication interface Controller
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 , non -maskable, and Reset Interrupt
Week 15	Exam II
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital Design: with an introduction to Verilog HDL by M. Morris Mano and Mechael D. Ciletti, 5th Edition, Pearson Education, 2013.	No
Recommended Texts	Advanced Digital Design with the Verilog HDL by Michael D Ciletti, 2nd edition, Pearson education, 2017	No
Websites	https://library.oapen.org/handle/20.500.12657/59717	

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 Communications & Networks			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE415**				
ECTS Credits	**7.00**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	7	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Abidulkarim K. I. Yasari		**e-mail**	abidulkarim@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/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	The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in the installation, monitoring, and troubleshooting of current LAN systems. Students are introduced to computer communication network design and its operations and discuss the following topics: Open Systems Interconnection (OSI) communication model; error detection and recovery; local area networks; bridges, routers, and gateways; network naming and addressing; and local and remote procedures. On completion of the course, students should be able, in part, to design, implement and maintain a typical computer networks.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	On completion of this course, the student will be able to: 1. Explain key networking concepts, principles, design issues and techniques at all protocol layers. 2. Contrast between different types of networks (e.g., wide area networks vs. local area networks, wired vs. wireless) in terms of their characteristics and protocols used. 3. Describe different types of networked applications and what underlying network protocols are needed to meet their diverse requirements. 4. Distinguish between control and data planes in computer networks, and their corresponding architectures in real-world networks (including the Internet). 5. Understand reliable transport protocols and networked system architectures via implementation using Socket APIs, measurement and analysis.
Indicative Contents المحتويات الإرشادية	1. Introduction to Computer Networking and the Internet. 2. Digital Communication Basics. 3. The Application Layer with comprehensive treatment of networked applications (incl. multimedia data and applications). 4. The Transport Layer. 5. The Network Layer. 6. The Data Link Layer. 7. The Medium Access Control Sub-Layer. 8. The Physical Layer. 9. Software-defined networking (SDN) 10. Network virtualisation and network function virtualisation (NFV). 11. Network management. 12. Introduction to data centre and wireless networks. 13. Overview and selected aspects of network security

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching Computer Communications & Networks to fourth-year students: 1. Develop into competent and engaged engineering professionals and apply their technical and managerial qualifications in the planning, designing, constructing, operating, and/or maintaining of the infrastructure concerning the field of electronic and communications engineering. 2. Using their skills to analyze and design systems, identify project execution means and materials, carry out cost estimation and analyses, and participate in directing technical activities for electronic and communications engineering projects or projects related to other fields. 3. Be able to actively participate in their communities and their profession by developing their oral, written, visual and graphic modes communication abilities when working as team members or leaders. 4. Initiate a program of continuous learning which may include studies leading to proficient licensure or a higher degree in engineering that provides continued development of their technical abilities and management skills, and attainment of professional expertise. 5. Improve their understanding of sustainability, professionalism, ethics, quality performance, and safety that allows them to be professional influential to society when solving engineering problems and creating solutions in the field of electronic and communications engineering.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	88	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.87
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 6, and 8
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Network Model and Network Architecture
Week 2	Protocols design Issues, Transmission and multiplexing
Week 3	Design and Analysis of Link Level Protocol
Week 4	Protocol Functionality, Layering and Framework (SP3)
Week 5	LAN Design, Architecture and Protocols (802.xx).
Week 6	Internet Protocol (IP) Design, Internet Addressing
Week 7	Mid-term Exam
Week 8	WAN Protocols and Network Architecture
Week 9	Transport Layer Protocol Design.
Week 10	Application Protocols: Email, FTP, Telnet and HTTP
Week 11	Wireless Networks
Week 12	IP Telephony and Internet Video
Week 13	Network Management Functions and Protocols
Week 14	Network Quality of Service (NQS)
Week 15	Network Models and Network Architecture

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	J. Kurose and K. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson Education, 2012	No
Recommended Texts	- L. Peterson and B. Davie, "Computer Networks: A Systems Approach", 5th edition, Morgan Kaufmann, 2011 - A. Tanenbaum and D. Wetherall, "Computer Networks", 5th Edition, Pearson, 2013	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	**Engineering Ethics**			**Module Delivery**	
Module Type	**Support**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UNI007**				
ECTS Credits	**1**				
SWL (hr/sem)	**25**				
Module Level	4		**Semester of Delivery**	7	
Administering Department			**College**	Eng.	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	-		**e-mail**	-	
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Explain definition of ethical concepts. 2. Explain the sources behind ethics in engineering proficiency. 3. Relating engineering ethics to cultural heritages. 4. Explain obligations on engineers towards society under ethics code. 5. Explain obligations towards employers. 6. Explain obligations towards colleagues and work team. 7. Explain obligations towards environment. 8. Explain correction measures in case of fail to comply to ethics code.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**At the end of the course, students should:** 1. Be able to distinguish among morals, values, ethics, and the law and to explore how they impact professional practice; 2. Have an increased personal understanding of issues related to ethics and the law. 3. Have examined one's own ethical decision-making processes and develop guidelines for enhancing one's ability to generate ethical behavior and solutions to conflicts arising in the practice.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Definition and sources of ethics [10 hrs]; Obligations on engineers and engineering works [10 hrs]; Professionalism and ethics; obligation towards society, occupation, teams in work, and environment [20 hrs]; and engineering responsibilities [10 hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course was designed in a way such that students are to take ethics considerations into account in their professional work and personal life even when they are not willing to become engineers. The course will give the basics of the field and how to obtain additional information in ethics philosophy. The course will give them a reasonable opportunity to understand the methods of solving ethical problems they may face during work. The strategy used in this course is outcome-based learning. It is to test the achievement of learning outcomes and changing upon. The instructor will focus on materials that expand students' feelings towards his/her responsibilities.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	17	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	1.13
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	8	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.53
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	25		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	6, 11	LO # 1-4
	Assignments	2	10% (10)	2, 4, 6, and 10	LO # 1-4
	Projects / Lab.	-	-	-	-
	Report/lab.	-	-	-	-
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3 hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to concepts of ethics.
Week 2	The concept of ethical behavior.
Week 3	Source and basics of Professional ethics.
Week 4	Cultural heritages and engineering ethics.
Week 5	Definition to the code of engineering ethics: rules and scope.
Week 6	Principles of engineering profession ethics
Week 7	Obligations on engineers: accepting responsibilities, conducting productivity, QA/QC implementation.
Week 8	Obligation to improve knowledge.
Week 9	Avoiding fraudulent behavior
Week 10	Obligation to the rights of others.
Week 11	Obligations towards employers
Week 12	Avoiding conflict of interests.
Week 13	Promote righteousness and integrity and reject fraudulent practices
Week 14	Examples from work.
Week 15	Examples from work (continue).
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	مدونة اخلاقيات ممارسة المهن الهندسية م.ب. ع. 002 – 2017 م.	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	VLSI Technology			**Module Delivery**	
Module Type	**Basic**			**Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE422**				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Durgham Al-Shebanee		**e-mail**	durgham.alshebanee@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Electronic III	**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	The course provides for final year undergraduates a solid and fundamental engineering view of digital system operation and how to design systematically well performing digital VLSI systems exceeding consistently, customer expectations and competitor fears. The aim is to teach the critical methods and circuit structures to identify the key 1 % of the circuitry on-chip which dominates the performance, reliability, manufacturability, and the cost of the VLSI circuit. With the current utilization of the deep submicron CMOS technologies (0.25 micron and below design rules) the major design paradigm shift is associated with the fact that the interconnections (metal Al or Cu wires connecting gates) and the chip communication in general is the main design object instead of active transistors or logic gates. The main design issues defining the make-or-break point in each project is associated with power and signal distribution and bit/symbol communication between functional blocks on-chip and off-chip. In the course we provide a solid framework in understanding: - Scaling of technology and their impact on interconnects - Interconnects as design objects - Noise in digital systems and its impact on system operation - Power distribution schemes for low noise - Signal and signaling conventions for on-chip and off-chip communication
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	The students are able to: 1. Understand the basic Physics and Modeling of MOSFETs. 2. Learn the basics of Fabrication and Layout of CMOS Integrated Circuits. 3. Study and analyze the performance of CMOS Inverter circuits on the basis of their operation and working. 4. Study the Static CMOS Logic Elements. 5. Study the Dynamic Logic Circuit Concepts and CMOS Dynamic Logic Families
Indicative Contents المحتويات الإرشادية	1. Analyze the use of procedural statements and routines in test bench design with system Verilog. 2. Apply OOP concepts in designing test bench with system Verilog. 3. Apply randomization concepts in designing test bench. 4. Understand use of multi-threading and inter process communication in test bench design. 5. Interface a system Verilog test bench with system C.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Here are the strategies that can be employed in teaching numerical analysis to third -year students: 1. based on the idea of VLSI that learning design successfully comes through having to communicate real meaning. 2. Support every student by breaking learning up into chunks and providing a concrete structure for each. 3. Approach teaching methods that involve engaging more than one

	sense at a time. 4. Promoting Choice Allows Students to Decide Their Path, Give students choices based on a variety of interests 5. A higher level of activating interest is to have students propose their own ideas for products and activities 6. Caring Makes All the Difference : We're all motivated by tasks that interest us. Like our students, when we care, we willingly spend hours carried away with researching, crafting, and revising our work

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	103	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.86
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, 3,and 4
	Assignments	2	10% (10)	2, 12	LO # 4, 5, and 6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Silicon, Lattice, Dopants, p-n Junction, nMos Transistor, nMOS operation, pMOS Transistor, Transistors as Switches.
Week 2	CMOS Invertor, CMOS NAND Gate, CMOS NOR Gate, 3- Input NAND Gate
Week 3	CMOS Fabrication, Implementation, Invertor Cross-Section, Fabrication, Layout, Simplified Design Rules.
Week 4	A Brief History, CMOS Gate Design, Pass Transistors.
Week 5	CMOS Latches and Flip-Flops, Standard Cell Layouts, Stick Diagram
Week 6	CMOS Capacitor, nCMOS I-V characteristics, p CMOS I-V characteristics, Gate and Diffusion Capacitance.
Week 7	Nonideeal Transistor behavior, High Field Effects, Mobility Degradation, Velocity Saturation, Channel Length Modulation
Week 8	Exam I
Week 9	Threshold Voltage Effects, Body Effects, Drain-Induced Barrier Lowering, Short Channel Effects.
Week 10	Leakage, Sub Threshold Leakage, Gate Leakage, Junction Leakage, Process and Environmental Variations.
Week 11	Pass Transistors, DC Response, Logic Level and Noise Margins.
Week 12	Transient Response, RC Delay Models, delay Estimation.
Week 13	Logical Error, Delay in a Logic Gate.
Week 14	Multistage Logic Networks, Choosing the Best Number of Stages, Summary.
Week 15	Exam II
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Devices and Circuit Theory (Robert L. Boylestad & Louis Nashelsky), 11th ed.(ISBN 978-0-13-262226-4).	No
Recommended Texts	Electronic Devices, by Thomas l. Floyd, 7th ed., (ISBN: 0-13-127827-4).	No
Websites	https://www.booksfree.org/analog-circuit-design-by-john-h-pdf-free-download/	

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	Satellite communication			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** X **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE423**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Riyadh Dakhil Mansoor		**e-mail**	riyadhdmu@mu.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE314	**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. Describe the Geography with reference to Satellite Orbits. 2. Illustrate the Satellite Subsystems and Link Design. 3. Categorize the Satellite Multiple Access Techniques and Earth Station Technology. 4. Outline the Various Applications of Satellite. 5. Illustrate the Basic Principles of Television.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. Understand the architecture of satellite systems as a means of high-speed, high communication range system. 2. Explain the fundamentals of orbital mechanics. 3. Explain various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access 1. Assess the phenomenon of satellite communication technologies and compare them to alternative systems. 2. Calculate numerical problems related to orbital motion and design of link budget for the given parameters and conditions 3. Analyse the multiple access schemes used in satellite communicationPredict propagation effects of electromagnetic waves in the optical fiber 4. Describe the statistical characteristics of propagating signals
Indicative Contents المحتويات الإرشادية	Indicative contents contain the following Unit– I: Advanced digital filter design techniques: Design of optimum equi-ripple FIR filters, Remez Algorithm, Parks-McClellan Algorithm, Differentiators, BPF, Hilbert transformer filters multiple band optimal FIR filters, Design of filters with simultaneous constraints in time and frequency response, Optimization methods for designing IIR Filters, Comparison of optimum FIR filters and delay equalized elliptic filters. Unit – II: Multirate DSP: The basic sample rate alteration – time – domain characterization, frequency – domain characterization: Cascade equivalences, filters in sampling rate alteration systems, digital filter banks and their analysis and applications, Multi-level filter banks. Unit – III: Linear prediction and optimum linear filters: forward and backward linear prediction, AR Lattice and ARMA lattice – ladder filters, Wieners filters for filtering on prediction. Unit – IV: DSP Algorithms: Levinson – Durbin algorithm, the Schur algorithm, The Goertzel algorithm, the chirp – z transform algorithm, Bluestein algorithm, computations of the DFT, concept of tunable digital filters. Unit – V: Applications of DSP: Speech Model of speech production, speech analysis – synthesis system vocoder analyzers and synthesizers, convolves

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching satellite communications courses to fourth-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students get progress. 3. Contextual Learning: Present the concepts of satellite communications in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate seminars and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of satellite communications design learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	113	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.53
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Overview of satellite systems
Week 2	Satellite orbital parameters
Week 3	The geostationary orbit
Week 4	Atmospheric attenuation
Week 5	Rain attenuation
Week 6	Atmospheric depolarization
Week 7	Midcourse exam
Week 8	The space segment
Week 9	The space link I
Week 10	The space link II
Week 11	Interference
Week 12	Satellite access I
Week 13	Satellite access II
Week 14	Specialized satellite services
Week 15	Review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2rd Edition, 2003	No
Recommended Texts	Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.SuyderhoudPearson Publications, 2nd Edition, 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	**Wireless & Mobile Communications**			**Module Delivery**	
Module Type	**Basic**			**Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE424**				
ECTS Credits	**7.00**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Abidulkarim K. I. Yasari		**e-mail**	abidulkarim@mu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE415	**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	**Subject content aims:** 1. To give insight into the history of cellular communications and the first, second, third and fourth generation standards 2. To introduce methods of traffic modeling for typical mobile applications including the specification of important quality of service requirements 3. To review wireless propagation mechanisms and understand a range of large-scale channel models and their use in dimensioning mobile communication systems 4. To describe methods for cellular network planning and introduce constraints and issues surrounding practical deployments 5. To introduce multiple access techniques and interference mitigation techniques 6. To introduce methods for dimensioning and evaluating the capacity of mobile communication networks 7. To develop skills in the selection and application of appropriate numeric and algebraic techniques 8. To develop skills in system level design based on operational parameters and constraints.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	Subject content learning outcomes After successful completion of this module, students will: 1. Be able to describe key characteristics of the different mobile communication standards and the motivation behind the development of each generation of standards of WSN 2. Be able to compare alternative approaches to traffic modeling and specify suitable models for mobile applications including quality of service requirements of WSN 3. Be able to use large-scale channel models or propagation measurement data to appropriately dimension cells 4. Be able to determine an appropriate frequency-reuse strategy for a mobile communication system and propose methods for enhancing the capacity of deployed networks 5. Be able to explain how fundamental multiple access techniques work and how a range of techniques can be used to mitigate against interference 6. Be able to appropriately dimension and calculate the capacity of simple Zigbee, wireless application,3G, 4G, terrestrial scenarios 7. Understand the principle features and technologies employed in the GSM, Wife applications , 3GPP-LTE standards 8.

Indicative Contents المحتويات الإرشادية	1. To introduce the basic mathematical concepts related to Wireless mobile communication. 2. To impart knowledge on the concepts of cellular mobile communication systems. 3. To impart knowledge on the concepts of last generations of Wireless mobile communication. 4. To impart knowledge on the concepts of modern techniques in Wireless mobile communication.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching numerical analysis to third -year students: 1. Reducing the time for tedious work. The activities in classrooms include some frequent and tedious tasks. 2. Engaging students in learning activities. Because of the limited resources in ordinary classrooms, students often merely accept the ready-prepared materials during learning activities. 3. Facilitating group collaborative learning. To implement collaborative learning activities in classrooms, teachers often confront two problems. 4. Empowering the teacher to monitor students' learning statuses. Generally, a wireless learning environment can facilitate students' individual or collaborative learning and expand their activity space, but it might be difficult for teachers to monitor each student's current learning status 5. Recording teaching and learning processes as portfolios. Before class, teachers need to systematically construct teaching materials in RCMS for themselves and learners to use during learning and teaching. 6. Implementing technology-supported activities smoothly. To allow teachers and students benefit from technology easily

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	113	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.5
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, 3,and 4
	Assignments	2	10% (10)	2, 12	LO # 4, 5, and 6
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Wireless Communication Systems.
Week 2	The Cellular Concepts System Design
Week 3	Traffic Engineering
Week 4	Large Scale Path Loss
Week 5	Exam I
Week 6	Small Scale Multipath Propagation.
Week 7	Multiple Access Techniques.
Week 8	Wireless Systems.
Week 9	Wi-Fi , Bluetooth and ZigBee.
Week 10	Exam II
Week 11	Course Review.
Week 12	Introduction to Wireless Communication Systems.
Week 13	The Cellular Concepts System Design
Week 14	Traffic Engineering
Week 15	Large Scale Path Loss
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Mobile Wireless Communications "Mischa Schwartz"	No
Recommended Texts	Principles of Mobile Communication "Gordon L. Stüber"	No
Websites	https://dafedil.com/wp-content/uploads/2020/05/2017_Book_PrinciplesOfMobileCommunicatio.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	Optical communication			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**ECE425**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Electronic & Communications		**College**	Eng.	
Module Leader	Riyadh Dakhil Mansoor		**e-mail**	riyadhdmu@mu.edu.iq	
Module Leader's Acad. Title	Assist. Prof.		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name	Scientific Committee		**e-mail**	-	
Scientific Committee Approval Date	/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ECE314	**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. To develop an understanding of the functionality of each of the components that comprise a fiber-optic communication system: transmitter, fiber, amplifier, and receiver. 2. To provide knowledge of the properties of optical fiber that affect the performance of a communication link. 3. To differentiate between direct modulation and external electro-optic modulation. 4. To understand the basic optical amplifier operation and its effect on signal power and noise in the system.
Module Learning Outcomes (LO) مخرجات التعلم للمادة الدراسية	1. Explain the different modes of propagation in an optical fiber. 2. Classify the construction and characteristics of optical sources and detectors. 3. Discuss optical networks and their non-linear effects. 4. Examine the losses and propagation characteristics of an optical signal. 5. Analyze system performance of optical communication systems. 6. To learn the various techniques of diversity and combining methods to improve the system's performance. 7. Predict propagation effects of electromagnetic waves in the optical fiber 8. Describe the statistical characteristics of light propagating signals
Indicative Contents المحتويات الإرشادية	Indicative contents contain the following 1. Review of Optical Fibers; Ray Model; Numerical Aperture of Step Index and Graded Index Fibers. 2. Recognizing the normalized Propagation Constant, Inter-modal & Intra-modal Dispersion, Single Mode Fibers; Dispersion Shifted and Dispersion Flattened Fibers. 3. Overview Attenuation Management and Fiber-optic Amplifiers; Dispersion Management and Techniques; System Design Consideration. 4. Knowing the basic propagation models and propagation mechanisms/impairments for light. 5. Basic System; Detection Principles; Practical Constraints; Modulation and Demodulation Schemes; Receiver Sensitivities-Probability of Error Calculations; Performance Comparison. 5. Recognizing various techniques of diversity and combining methods to improve the system performance

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Here are the strategies that can be employed in teaching optical communications courses to fourth-year students: 1. Communicative Approach: Emphasize interactive and meaningful communication. Encourage students to engage in pair work and group discussions. 2. Scaffolded Instruction: Provide structured support and gradually increase the difficulty level as students get progress. 3. Contextual Learning: Present the concepts of fiber optics communications in meaningful contexts to enhance understanding and retention. Use real-life situations, visual aids, authentic materials, and multimedia resources to make the learning experience more relevant and engaging. 4. Active Learning: Encourage students to participate in the learning process actively. Incorporate seminars and interactive exercises to promote engagement and develop design skills. 5. Multi-Sensory Approach: Utilize various senses to enhance learning. Incorporate visual aids, audio recordings, gestures, and kinesthetic activities to cater to different learning styles and reinforce understanding of the fundamentals of fiber communications design learning. 6. Formative Assessment: Regularly assess students' progress and provide constructive feedback. Use various assessment methods, such as quizzes, speaking tasks, listening exercises, and short written assignments, to gauge their understanding and identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	128	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	8.53
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	30% (10)	5, 10	LO #1, 2, 3, 4,5, and 6
	Assignments	2	10% (10)	2, 12	LO # 3, 8, and 9
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to optical fibers
Week 2	Optical sources
Week 3	Optical detectors
Week 4	Non-coherent optical communication
Week 5	Coherent optical communication system I
Week 6	Coherent optical communication system II
Week 7	Midcourse exam
Week 8	Optical multiplexed system I
Week 9	Special antenna
Week 10	Optical multiplexed system II
Week 11	Optical amplifier I
Week 12	Optical amplifier II
Week 13	Optical network I
Week 14	Optical network II
Week 15	Review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Govind P. Agrawal, Fiber-Optic Communication Systems, John Wiley & Sons, Third edition (2002	No
Recommended Texts	G. Keiser, Optical Fiber Communication, Tata McGraw Hill, 2013.	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.