	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa College of Advanced Technologies Department of Electrical Engineering Techniques	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Technologies**			**Module Delivery**	
Module Type	**Core**			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☒ Seminar	
Module Code	**EET1102**				
ECTS Credits	**6**				
SWL (hr/sem)	**180**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	ENG – EET		**College**	EETC	
Module Leader	Ali Abed Hussein		**e-mail**	a.u.h.altalby2018@gmil.com	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Ali Abed Hussein		**e-mail**	a.u.h.altalby2018@gmil.com	
Scientific Committee Approval Date	22/6/2026		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop a solid understanding of fundamental digital principles: The aim is to grasp the basic concepts of digital logic, number systems, Boolean algebra, and logic gates, providing a strong foundation for further studies in digital circuits and systems. 2. To acquire practical skills in circuit design and implementation: The aim is to develop practical skills in designing, implementing, and testing digital circuits using laboratory equipment, integrated circuits, and various logic gates. 3. To enhance problem-solving and analytical thinking abilities: The aim is to cultivate problem-solving skills by analyzing and simplifying complex digital circuits using Boolean algebra, truth tables, and logic simplification techniques. 4. To foster teamwork and collaboration: The aim is to encourage collaboration through group projects, lab exercises, and discussions, fostering teamwork skills and the ability to work effectively in a digital design environment. 5. To promote critical thinking and application of knowledge: The aim is to encourage critical thinking by applying theoretical knowledge to real-world scenarios, such as designing circuits to perform specific functions or solving digital logic problems using different logic gates and techniques.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a comprehensive understanding of digital principles: Students will be able to explain the fundamental concepts of digital logic, number systems, Boolean algebra, and logic gates, and apply this knowledge to analyze and design digital circuits. 2. Apply theoretical knowledge to practical circuit design: Students will be able to utilize their understanding of digital principles to design, implement, and test digital circuits using appropriate components, such as logic gates, integrated circuits, and laboratory equipment. 3. Analyze and simplify complex digital circuits: Students will develop the ability to analyze complex digital circuits using Boolean algebra, truth tables, and logic simplification techniques. They will be able to simplify circuits to their minimal form and optimize them for efficient operation. 4. Collaborate effectively in team projects: Students will demonstrate effective teamwork skills by actively participating in group projects, lab exercises, and discussions. They will be able to work collaboratively, contribute their ideas, and communicate effectively with their team members. 5. Apply critical thinking to solve digital logic problems: Students will develop critical thinking skills by applying their knowledge of digital principles to solve problems and design circuits to meet specific requirements. They will be able to

	evaluate different approaches, select appropriate logic gates, and devise effective solutions.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **1. Number systems and Boolean algebra: [24 hrs.]** • Introduction to binary, decimal, octal, and hexadecimal number systems • Conversion between number systems • Boolean algebra operations (AND, OR, NOT) • Laws and theorems of Boolean algebra **2. Logic gates and combinational logic circuits: [24 hrs.]** • Introduction to logic gates (AND, OR, NOT, XOR, NAND, NOR) • Truth tables and logic simplification techniques (Karnaugh maps, Boolean algebra) • Combinational logic circuits design and analysis • Multiplexers and demultiplexers **3. Flip-flops and sequential logic circuits: [26 hrs.]** • Introduction to flip-flops (SR, JK, D, T) • Analysis and design of sequential logic circuits • State diagrams and state tables • Registers and counters

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Two main strategies will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. • Theory-Based Lectures: Traditional classroom lectures are used to present theoretical concepts, principles, and theories related to electrical engineering. Professors or instructors explain complex ideas, provide examples, and engage students in discussions to foster understanding. • Laboratory Experiments: Laboratory sessions are an integral part of electrical engineering education. Students engage in hands-on experiments, using equipment, instruments, and software tools to apply theoretical knowledge, analyze data, and gain practical skills. This helps them understand the practical aspects of electrical engineering and reinforces theoretical concepts.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	74	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
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	180

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10 % (10)	5,10	LO # 1, 2, 8, and 9
	Assignments	2	10 % (10)	2,12	LO # 3,4,6,and 7
	Lab.	1	10 % (10)	Continuous	All
	Report	1	10 % (10)	14	LO # 1-14
Summative assessment	**Midterm Exam**	2 hours	10 % (10)	7	LO # 1-7
	Final Exam	2 hours	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Numerical Systems: Decimal, Binary, Octal, Hexadecimal.
Week 2	Conversion between Decimal and Binary. Conversion between Decimal and Octal.
Week 3	Conversion between Decimal and Hexadecimal. Conversion between Octal and Binary.
Week 4	Conversion between Hexadecimal and Binary. Binary Arithmetic: Addition and Subtraction.
Week 5	Binary Arithmetic: Using Complements for Subtraction. Introduction to Logic Gates: AND, OR, NOT.
Week 6	Implementing Logic Gates with Switches. Implementing AND and OR Gates with Diodes and Resistors
Week 7	Implementing AND, OR, and NOT Gates with Transistors. Introduction to XOR and XNOR Gates.
Week 8	Boolean Algebra: De Morgan's Theorems. Boolean Algebraic Relationships
Week 9	Implementing Different Gates using NAND Gate. Implementing Different Gates using NOR Gate.
Week 10	Circuits with Different Gates: Truth Table and Logic Equation. Simplification of Logic Circuits with Boolean Algebra.
Week 11	Introduction to Karnaugh Map: 2-variable and 3-variable Maps. Transferring Truth Table to Karnaugh Map

Week 12	Karnaugh Map: 4-variable Map. Examples of Digital Circuits with Karnaugh Map.
Week 13	Simplification of Logic Circuits with Karnaugh Map: Don't Care Conditions. Logic Circuits with the Property of Folding and Interlocking.
Week 14	Arithmetic Circuits: Half-Adder and Full-Adder. Arithmetic Circuits: Half-Subtractor and Full-Subtractor.
Week 15	Review and Revision. Practice Exam and Preparation for Final Assessment
Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Laboratory Equipment and their Usage. Deriving Truth Tables for NOT, AND, and OR Gates using Switches.
Week 2	Deriving Truth Tables for NOT, AND, and OR Gates using Diodes and Transistors. Implementing NOR and NAND Gates using Diodes and Transistors
Week 3	mplementing and Verifying Exclusive OR (EXOR) and Exclusive NOR (EXNOR) Gates. Implementing De Morgan's First and Second Laws.
Week 4	Constructing Basic Gates using NAND Gate IC7400. Constructing Basic Gates using NOR Gate IC7402.
Week 5	Constructing EXOR Gate using NAND Gate and again using NOR Gate. Half-Adder Circuit using Different Gates and NAND Gate again
Week 6	Half-Subtractor Circuit using Different Gates and NAND Gate again. Full-Adder Circuit using Different Gates and NAND Gate again.
Week 7	Full-Subtractor Circuit using Different Gates and NAND Gate again. Implementing Full-Adder and Full-Subtractor Circuits.
Week 8	Implementing Half-Adder and Half-Subtractor Circuits.
Week 9	Implementing Full-Adder and Full-Subtractor Circuits using ICs. Using Integrated Circuits for Addition and Subtraction.
Week 10	Introduction to Integrated Circuits (ICs). Implementing 4-bit Binary Addition using ICs.
Week 11	Implementing 4-bit Binary Subtraction using ICs. Implementing Arithmetic Circuits using ICs.
Week 12	Practice Exam and Preparation for Assessment
Week 13	Implementing Half-Carry and Full-Carry Lookahead Adders. Introduction to Carry Lookahead Adder Circuits.
Week 14	Implementing Multiplexers and Demultiplexers.
Week 15	Design, Implementation, and Testing of a Complex Digital Circuit. Course review and feedback.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	J. F. Wakerly, "Digital Design: Principles and Practices," 4th ed. Pearson Education, 2005.	Yes

Grading Scheme
مخطط الدرجات

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

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

استاذ المادة : م.د. علي عبد حسين عزيز

التاريخ:2026/1/22

رئيس القسم

التاريخ :