

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Digital Combinational Systems		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	4
Administering Department	Laser & Optoelectronics Engineering	College	College of Engineering
Module Leader	Abbas Abdulaali	e-mail	abbas.abdulali@alayen.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	Abbas Abdulaali	e-mail	abbas.abdulali@alayen.edu.iq
Peer Reviewer Name	Name	e-mail	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	

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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	
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		B2	B2.1 Communicate effectively – graphically with a range of audiences using contemporary tools. B2.2 Communicate verbally and in writing with a range of audiences using contemporary tools.
	Ethics	C3	C3.1 Utilize contemporary technologies. C3.3 Utilize health and safety requirements.
abblndicative Contents المحتويات الإرشادية	Part A – Digital Systems Fundamentals 1. Introduction to digital systems 2. Analog and digital quantities 3. Decimal number system Part B – Number Systems and Codes 1. Binary number system 2. Decimal–binary conversions 3. Binary arithmetic 4. Signed numbers and complements 5. Octal and hexadecimal number systems 6. BCD and digital codes Part C – Logic Gates 1. NOT gate 2. AND gate 3. OR gate 4. NAND gate 5. NOR gate 6. XOR and XNOR gates Part D – Boolean Algebra 1. Boolean operations and expressions 2. Laws and rules of Boolean algebra 3. DeMorgan's theorem 4. Simplification using Boolean algebra Part E – Logic Minimization 1. Truth tables		



	- Standard forms of Boolean expressions - Karnaugh map minimization - SOP and POS simplification Part F – Combinational Logic Circuits - Universal gates (NAND and NOR) - Binary adders - Comparators - Decoders and encoders - Code converters - Multiplexers and demultiplexers - Parity generators and checkers
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Presentation - Interactive learning - Discussions - Brainstorming - Group Solving Problems - Problem-Based Learning - Self-learning

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	85	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
SFormative assessment	Quizzes	2	10% (10)	5 and 10	A1.1, A1.2, A1.3, A1.4, A2.1, A2.2, A4.1
	Assignments	2	10% (10)	2 and 12	A2.1, A2.2, A4.1, A4.2, B2.1, B2.2
	Projects / Lab.	1	10% (10)	Continuous	A4.1, A4.2, B2.1, B2.2, C3.1, C3.3
	Report	1	10% (10)	13	B2.2, C3.1
Summative assessment	Midterm Exam	2hr	10% (10)	7	A1.1, A1.2, A1.3, A1.4, A2.1
	Final Exam	3hr	50% (50)	16	A1.1, A1.2, A1.3, A1.4, A2.1, A2.2, A4.1, A4.2
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)		
المنهاج الاسبوعي النظري		
	Material Covered	Los
Week 1	Introduction to Digital Systems, Analog vs Digital Quantities, Decimal Numbers	A1.1
Week 2	Binary Numbers, Conversions, Binary Arithmetic	A1.3
Week 3	1's and 2's Complement of Binary Numbers, Signed Numbers and their Arithmetic Operations	A1.3
Week 4	Hexadecimal and Octal Numbers, BCD Codes	A1.2
Week 5	The Inverter, The AND Gate, The OR Gate, The NAND Gate, The NOR Gate, The Exclusive-OR and Exclusive-NOR Gates.	A1.4, B2.1
Week 6	Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, DeMorgan's Theorem, Simplification using Boolean Algebra	A2.1
Week 7	Mid-term Exam + Standard Forms of Boolean Expressions.	A2.1
Week 8	Boolean Expressions and Truth Tables.	A2.2, B2.1
Week 9	The Karnaugh Map, Karnaugh Map SOP Minimization.	A4.1, B2.1
Week 10	Karnaugh Map POS Minimization.	A4.1
Week 11	Basic Combinational Logic Circuits and their implementation, Universal Properties of NAND and NOR Gates, and their use in Combinational Logic, Logic Circuit Operation with pulse Waveforms.	A4.1, C3.1
Week 12	Basic and Parallel Binary Adders.	A4.2, B2.2



Week 13	Comparators, Decoder.	A4.2
Week 14	Encoder, Code Converters.	A4.2, C3.3
Week 15	Multiplexers, Demultiplexers, Parity Generators/Checkers.	A4.2
Week 16	Preparatory week before the final Exam.	All

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر		
	Material Covered	Los
Week 1-3	Logic Gates	B2.1, C3.3
Week 4-6	Combinational Logic Circuits	B2.1, C3.1
Week 7-9	Karnaugh Maps	B2.1, A4.1
Week 10-11	Code Conversion	B2.1, B2.2
Week 12-13	Basic Arithmetic Operations	B2.2, A4.2
Week 14-15	Comparators	B2.1, C3.1, C3.3

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	M. Morris Mano & Michael D. Ciletti Digital Design , 5th Edition, Pearson Education, 2013. Thomas L. Floyd Digital Fundamentals , 11th Edition, Pearson Education, 2015.	Yes
Recommended Texts	Stephen Brown & Zvonko Vranesic Fundamentals of Digital Logic with Verilog Design , 3rd Edition, McGraw-Hill, 2013. Ronald J. Tocci, Neal Widmer & Gregory Moss Digital Systems: Principles and Applications , 12th Edition, Pearson, 2017. Charles H. Roth Jr. & Larry L. Kinney Fundamentals of Logic Design , 7th Edition, Cengage Learning, 2014.	No
Websites	https://eng.alayen.edu.iq/colleges/e/42	



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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.				

