

وزارة التعليم العالي والبحث العلمي  
جهاز الإشراف والتقويم العلمي  
دائرة ضمان الجودة والاعتماد الأكاديمي

## استمارة وصف البرنامج الأكاديمي للكليات والمعاهد

للعام الدراسي ٢٠٢٣-٢٠٢٤

الجامعة : تكريت

الكلية/ المعهد: كلية هندسة العمليات النفطية

القسم العلمي : هندسة سيطرة المنظومات النفطية

تاريخ ملء الملف : ٢٠٢٣/١١/٢٥

التوقيع :

اسم المعاون العلمي : أ.م.د. عمر ياسين ضايح

التاريخ : ٢٠٢٣/١٢/٣

التوقيع :

اسم رئيس القسم : م. ياسين خضر ياسين

التاريخ : ٢٠٢٣/١١/٢٨

دقق الملف من قبل

شعبة ضمان الجودة والأداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي: م.م. أيوب إبراهيم محمد

التاريخ : ٢٠٢٣/١١/٢٨

التوقيع :

مصادقة السيد العميد

أ.م.د. غسان حمد عبد الله

٢٠٢٣/١٢/٣

التوقيع :



Ministry of Higher Education and Scientific Research – Iraq  
Tikrit University  
College of Petroleum Processes Engineering  
Department of Petroleum Control Systems Engineering



## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Digital Technique</b>		Module Delivery
Module Type	Support		<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	<b>PCS112</b>		
ECTS Credits	6		
SWL (hr/sem)	<b>150</b>		
Module Level	1	Semester of Delivery	
Administering Department	PCS	College	PPE
Module Leader	Mohammed K. Khalis	e-mail	Mohammed.khalis@tu.edu.iq
Module Leader's Acad. Title	Asst. Lecturer	Module Leader's Qualification	MSc
Module Tutor	N/A	e-mail	N/A
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date		Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b></p> <p>أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. Learn about common numbering systems, such as binary, octal, and hexadecimal.</li> <li>2. Logic gates specifications.</li> <li>3. Simplification and design of Boolean functions</li> </ol>
<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. Knowledge and understanding: Minimize functions using any type of minimizing algorithms (Boolean algebra, Karnaugh map or Tabulation Method).</li> <li>2. Cognitive skills (thinking and analysis). Define the problem (Inputs and Outputs), and write its functions. Implement functions using digital circuits.</li> <li>3. Practical and subject-specific skills (Transferable Skills). Work effectively with others. Use simulation software, for testing the designed circuit.</li> <li>4. The ability to use the techniques, skills and tools of contemporary engineering in the engineering field to control petroleum systems.</li> <li>5. The possibility of designing and implementing experiments, analyzing and translating the results into the real environment.</li> <li>6. Understand the impact of engineering solutions globally and economically.</li> </ol>
<p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p><b><u>Part A - Numbering Systems &amp; Logic Gates</u></b></p> <p><b>Numbering Systems</b> – Decimal numbers, binary numbers, decimal to binary conversion, binary to decimal conversion, binary arithmetic, 1's and 2's complement of binary numbers, hexadecimal numbers, binary to hexadecimal conversion, hexadecimal to binary conversion, hexadecimal to decimal conversion, decimal to hexadecimal conversion, hexadecimal arithmetic and octal numbers.</p> <p style="text-align: right;">[12 hrs]</p> <p>Binary Coded Decimal (BCD) numbers, some common 4-bit decimal codes, Gray code, binary to Gray conversion, Gray to binary conversion, signed numbers and arithmetic operations with signed numbers.</p> <p style="text-align: right;">[8 hrs]</p> <p><b>Logic Gates</b> – NOT, AND, OR, NAND, NOR, X-OR, and X-NOR gates.</p> <p style="text-align: right;">[8 hrs]</p>

	<p><b><u>Part B - Boolean Algebra &amp; Karnaugh Map</u></b></p> <p><b>Boolean Algebra</b> - Laws of Boolean algebra, rules of Boolean algebra, DeMorgan's theorems, Boolean analysis of logic circuits, the Boolean expression for a logic circuit, constructing a truth table for a logic circuit, simplification using Boolean algebra, the Sum-of-Products (SOP) form, the Product-of-Sums (POS) form, converting standard SOP to Standard POS, converting standard POS to standard SOP.</p> <p style="text-align: right;">[16 hrs]</p> <p><b>Karnaugh map</b> - the 3-variables Karnaugh map, the 4-variables Karnaugh map, the 5-variables Karnaugh map, Karnaugh map SOP minimization, mapping a standard SOP expression, mapping a nonstandard SOP expression, Karnaugh map simplification of SOP expressions, Don't care conditions, Karnaugh map POS minimization, mapping a standard POS expression, mapping a nonstandard POS expression, Karnaugh map simplification of POS expressions.</p> <p style="text-align: right;">[12 hrs]</p>
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<p><b>Learning and Teaching Strategies</b></p> <p>استراتيجيات التعلم والتعليم</p>	
<p><b>Strategies</b></p>	<p>The main strategies that will be adopted in delivering this module are summarized as follows:</p> <ol style="list-style-type: none"> <li>1- Encourage the student's participation in the lecture explanation and solving exercises by rewarding those who answer correctly with bonus marks.</li> <li>2- Encourage the students to pay high attention to the lecture explanation provided by the lecturer by making intentional simple mistakes during the lecture and reward those who find those mistakes and correct them quickly with bonus marks.</li> <li>3- Acquiring feedback from students by stopping the explanation every 15 minutes to ask if there is any question or obscure part of the explanation. Then, ask a sample of the students to ensure that the explanation is understood and well received.</li> <li>4- Instilling the spirit of competition among students by giving them extra assignments and asking them to complete those assignments in a given time. Those who complete the assignments before the deadline will be discussed to ensure there is no cheating. If no cheating is spotted, the students will be rewarded handsomely with extra marks.</li> </ol>

<b>Student Workload (SWL)</b>			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	59	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	91	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

<b>Module Evaluation</b>					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)	5, 10	LO # 1 and 2
	<b>Assignments</b>	2	10% (10)	2, 12	LO # 2-5
	<b>Lab. Reports</b>	7	10% (10)	Continuous	All
	<b>Lab. Exam</b>	2	10% (10)	7, 14	LO # 1, 3-5
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	LO # 1 and 2
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b>	
المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	Introduction - Numbering Systems – Decimal Numbers, Binary Numbers

<b>Week 2</b>	Decimal to Binary Conversion, Binary to Decimal Conversion, Binary Arithmetic, 1's And 2's Complement of Binary Numbers
<b>Week 3</b>	Hexadecimal Numbers, Binary to Hexadecimal Conversion, Hexadecimal to Binary Conversion, Hexadecimal to Decimal Conversion, Decimal to Hexadecimal Conversion, Hexadecimal Arithmetic and Octal Numbers.
<b>Week 4</b>	Binary Coded Decimal (BCD) Numbers, Some Common 4-Bit Decimal Codes, Gray Code
<b>Week 5</b>	Binary to Gray Conversion, Gray to Binary Conversion, Signed Numbers And Arithmetic Operations With Signed Numbers
<b>Week 6</b>	Introduction to Logic Gates – NOT, AND, OR Gates
<b>Week 7</b>	NAND, NOR, X-OR, And X-NOR Gates.
<b>Week 8</b>	Boolean Algebra - Laws of Boolean Algebra, Rules of Boolean Algebra
<b>Week 9</b>	Demorgan's Theorems, Boolean Analysis of Logic Circuits, The Boolean Expression for A Logic Circuit, Constructing A Truth Table for A Logic Circuit
<b>Week 10</b>	Simplification Using Boolean Algebra, The Sum-Of-Products (SOP) Form, The Product-Of-Sums (POS) Form
<b>Week 11</b>	Converting Standard SOP to Standard POS, Converting Standard POS to Standard SOP
<b>Week 12</b>	Karnaugh Map - The 3-Variables Karnaugh Map, The 4-Variables Karnaugh Map, The 5-Variables Karnaugh Map
<b>Week 13</b>	Karnaugh Map SOP Minimization, Mapping A Standard SOP Expression, Mapping A Nonstandard SOP Expression, Karnaugh Map Simplification of SOP Expressions
<b>Week 14</b>	Karnaugh Map POS Minimization, Mapping A Standard POS Expression, Mapping A Nonstandard POS Expression, Karnaugh Map Simplification of POS Expressions.
<b>Week 15</b>	<b>Preparatory week before the Final Exam</b>
<b>Week 16</b>	<b>Final Exam</b>

## Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1-2	Lab 1: Introductory lecture on the Digital Technique training board and the other laboratory tools.
Week 3-4	Lab 2: Introductory lecture to the Multisim and learn how to create and simulate logic circuits.
Week 5-6	Lab 3: Logic gates
Week 7-8	Lab 4: Decimal to binary and binary to decimal converters
Week 9-10	Lab 5: The applications of Exclusive-OR
Week 11-12	Lab 6: Boolean Algebra
Week 13-14	Lab 7: Universal gates: NAND and NOR

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Digital System Principles and Applications, by Ronald J. Tocci.	Yes (Electronic Copy)
Recommended Texts	Digital Principles and Applications, by Malvino Leach.	Yes (Electronic Copy)
Websites	<a href="https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering">https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering</a>	

## 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

	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group</b> <b>(0 – 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work is required but credit awarded
	<b>F</b> – 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.