

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Fundamentals of Electrical Engineering</b>	Module Delivery	
Module Type	<b>Core</b>	<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	<b>ENG005</b>		
ECTS Credits	<b>6</b>		
SWL (hr/sem)	<b>150</b>		
Module Level	UGI	Semester of Delivery	2
Administering Department	CV101	College	Civil Engineering College
Module Leader	Saif Aldeen Mukdad Naji	e-mail	saifeddine.miqdad@uoanbar.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	M.Sc
Module Tutor		e-mail	
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Aims</b></p> <p>أهداف المادة الدراسية</p>	<p>1-Understanding basic concepts: Study material should explain voltage, current, resistance, and power. It should explain how electrical circuits express these variables and their interactions.</p> <p>2-Circuit analysis: Ohm's Law, Kirchhoff's laws, and circuit simplification should be covered. It should demonstrate how to solve fundamental circuit difficulties using these methods.</p> <p>3-Component identification and behavior: The study material should assist students recognize resistors, capacitors, and inductors. It should describe their attributes, circuit behavior, and value and characteristic calculations.</p> <p>4-Series and parallel resistors, capacitors, and inductors should be covered. These configurations affect circuit voltage, current, and power distribution.</p> <p>Circuit analysis tools: The study material should include circuit diagrams, schematic symbols, and multimeters. It should teach circuit diagram interpretation and instrument usage.</p> <p>5-Problem-solving skills: The content should contain several practice problems and exercises. It should motivate students to tackle diverse circuit difficulties using the studied principles and skills.</p> <p>6-Safety: Study material should highlight electrical safety. It should include electrical component safety, tool usage, and danger avoidance.</p> <p>7-Real-life applications: The content should show how electrical circuits are used in electronics, power systems, telecommunications, and control systems. Showing how electrical circuits are employed in different technologies could motivate pupils.</p> <p>8-Theory and practice: The content should include hands-on experiments or simulations to reinforce theoretical notions. Students should design basic circuits, measure their attributes, and observe their intended behavior.</p> <p>9-Self-assessment and progress tracking: Self-assessment quizzes, exercises with answers, and progress tracking tools enable students evaluate their comprehension, identify areas for growth, and monitor their progress over time.</p>
<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<p>1-Students should comprehend voltage, current, resistance, power, and Ohm's law.</p> <p>2-Analyze and solve circuits: Kirchhoff's laws, nodal analysis, and mesh analysis should help students analyze and solve basic electrical circuits.</p> <p>3-Apply circuit theorems: Students should be able to simplify and solve complicated circuits using Thevenin's and Norton's theorems.</p> <p>4-Calculate power and energy in electrical circuits: Students should grasp actual, reactive, and perceived power.</p>

	<p>5-Use measuring instruments: Students should know how to use multimeters and oscilloscopes to measure voltage, current, and other electrical characteristics.</p> <p>6-Design and construct circuits: Students should be able to design simple electrical circuits to satisfy requirements, including component choices, voltage levels, and power ratings.</p> <p>7-Troubleshoot circuits: Students should learn to recognize and fix electrical circuit faults such open circuits, short circuits, and malfunctioning components.</p> <p>8-Safety awareness: When dealing with electrical circuits, students should grasp the risks and observe safety protocols.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p><b><u>Chapter One: Basic Principle of Electrical Circuits</u></b> Definition of electrical circuits Types of circuits (series, parallel, and combination circuits) Basic circuit elements (voltage source, current source, resistors, capacitors, and inductors) Circuit symbols and notation [4 h]</p> <p><b><u>Chapter Two: Ohm's Law and DC Circuits</u></b> Ohm's Law and its applications Voltage, current, and resistance relationships Power and energy calculations in DC circuits [4 h]</p> <p><b><u>Chapter Three: Kirchhoff's Laws (Kirchhoff's voltage law and Kirchhoff's current law)</u></b> Analysis techniques for DC circuits (node voltage method and mesh current method) [4 h]</p> <p><b><u>Chapter Four: Circuit Analysis Techniques</u></b> Series and parallel resistive circuits Voltage and current division rules [4 h]</p> <p><b><u>Chapter Five: Thevenin's and Norton's theorems</u></b> Superposition theorem Maximum power transfer theorem Capacitors and Inductors [4 h]</p> <p><b><u>Chapter Six: Capacitance and Inductance calculations</u></b> Inductance and inductance calculations Time constants and charging/discharging of capacitors Inductive and capacitive reactance AC circuits with capacitors and inductors Alternating Current (AC) Circuits [4 h]</p> <p><b><u>Chapter seven AC voltage and current waveforms</u></b> Phasors and phasor representation of AC quantities Impedance and admittance in AC circuits AC circuit analysis techniques (nodal analysis and mesh analysis) Power calculations in AC circuits (real power, reactive power, and apparent power) Resonance and Filters Resonance in RLC circuits Bandwidth and quality factor Low-pass, high-pass, band-pass, and band-stop filters Frequency response of filters[4 h]</p>
<p><b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم</p>	
<p><b>Strategies</b></p>	<p>Hands-on experiments: Let students create and modify fundamental electrical circuits using actual components. This hands-on method shows kids how circuit parts</p>

	<p>affect behavior. Diagrams, pictures, and animations assist students visualize electron transport, current routes, and circuit topologies. Visuals simplify abstract ideas.</p> <p>Interactive simulations: Use online simulations or virtual circuit-building tools to let students test circuit components in a safe virtual environment. Students may test and debug circuits without real components.</p> <p>Conceptual frameworks: Show pupils how circuit diagrams and schematic symbols represent and link components. Teach them circuit diagram analysis and prediction.</p> <p>Problem-solving exercises: Give pupils circuit-related problems to solve. Encourage students to study circuits, compute voltage and current, and find circuit linkages.</p> <p>Group discussions and peer teaching: Have students explore and explain circuit principles in group talks or projects. Peer teaching helps students learn and reinforce their knowledge.</p> <p>Real-life applications: Show how circuit ideas apply to real-life situations. Discussing circuits in common items, electrical systems, and technological breakthroughs might motivate pupils.</p> <p>Formative evaluation: Quizzes, mini-projects, and concept-based questions should be given often. Quickly correct mistakes and help pupils understand electrical circuits.</p>
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Module Evaluation						
تقييم المادة الدراسية						
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome	
Formative Assessment	Quizzes	Quizzes	5	25% (20)	3, 6,10,14	LO #1, 2, 3, and 4
	Online Assignments (HomeWorks)		1	4% (4)	1, 2, ...,15	LO #1, 2, 3, and 4
	Onsite Assignments (Class Works)			5% (5)		
	Report					
	Lab 15% of the 40		1	6% (6)		LO #1, 2, and 3
Summative Assessment 60%	Midterm Exam		2 hr	10% (10)	8	LO #1, 2, and 4
	Final Exam 50%	Theory	3 hr	40% (40)	All	All
		Lab		10		
Total assessment				Final Exam		
				100% (100 Marks)		

Student Workload (SWL)			
الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	78	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	
<b>Week 2</b>	Week 1: Introduction to Electrical Circuits
<b>Week 3</b>	Week 2: Parallel circuits and calculations
<b>Week 4</b>	Week 3: Circuit Analysis Techniques
<b>Week 5</b>	Week 4 : Kirchhoff's Laws (current and voltage) and their applications
<b>Week 6</b>	Week 5: Mesh analysis
<b>Week 7</b>	Week 6: Thevenin and Norton equivalent circuits
<b>Week 8</b>	Week 7: Capacitors and Inductors
<b>Week 9</b>	Week 8: Introduction to capacitors and their behavior in circuits
<b>Week 10</b>	Week 9: Capacitors in series and parallel
<b>Week 11</b>	Week 10: Capacitive reactance and impedance
<b>Week 12</b>	Week 11: Introduction to inductors and their behavior in circuits
<b>Week 13</b>	Week 12: Inductors in series and parallel, inductive reactance and impedance
<b>Week 14</b>	Week 13: AC Circuits
<b>Week 15</b>	Week 14: Introduction to alternating current (AC) circuits
<b>Week 16</b>	Week 15: AC voltage, current, and power calculations

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1, 2, 3</b>	Week 1-2-3: Introduction to Lab Equipment and Safety Lab safety guidelines and procedures Introduction to lab equipment (multimeters, power supplies, breadboards)
<b>Week 4, 5, 6</b>	Week 4-5-6: Measurement techniques using multimeters Breadboard basics and circuit assembly techniques Circuit troubleshooting and error analysis Basic Circuit Measurements and Analysis Measurement of voltage and current in DC circuits Measurement of resistance and continuity testing Verification of Ohm's Law
<b>Week 7, 8, 9</b>	Week 7-8-9 : Series and parallel circuit measurements and calculations Verification of Kirchoff's Laws using circuit simulations and measurements Circuit Building Blocks and Analysis Techniques Building and testing basic resistor networks Introduction to capacitors and their behavior in circuits Measurement of capacitance and time constants

	Introduction to inductors and their behavior in circuits Measurement of inductance and transient response analysis
<b>Week 10, 11, 12</b>	Week 10-11-12: AC Circuits and Power Measurements Measurement of AC voltage, current, and power
<b>Week 13, 12, 13, 14, 15,16</b>	Week 13 : Analysis of resistive, capacitive, and inductive AC circuits Power factor measurement and correction techniques Week 14-16 :Impedance measurement and frequency response analysis Introduction to oscilloscope usage and waveform analysis

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	<p>"Practical Electronics for Inventors" by Paul Scherz and Simon Monk: This book introduces basic electronic circuits, components, and theory. It covers topics like resistors, capacitors, inductors, diodes, transistors, and integrated circuits.</p> <p>"Electricity and Magnetism" by Edward M. Purcell: This textbook offers a thorough introduction to electricity and magnetism, including basic electrical circuits. It covers fundamental concepts and principles with clear explanations and examples.</p> <p>Khan Academy: Khan Academy offers a wide range of video tutorials and interactive exercises on electrical circuits. Their resources cover topics such as voltage, current, resistance, Ohm's law, series and parallel circuits, and circuit analysis.</p> <p>All About Circuits (<a href="http://www.allaboutcircuits.com">www.allaboutcircuits.com</a>): This online resource provides a wealth of educational material on electrical circuits. It offers comprehensive articles, tutorials, and interactive tools for learning and experimenting with circuits.</p> <p>CircuitLab (<a href="http://www.circuitlab.com">www.circuitlab.com</a>): CircuitLab is an online circuit simulator and schematic editor. It allows students to design and simulate electronic circuits in a virtual environment. The website also provides a collection of example circuits and tutorials.</p> <p>TeachEngineering (<a href="http://www.teachengineering.org">www.teachengineering.org</a>): This website offers a collection of lesson plans, activities, and resources for teaching electrical circuits to students of different grade levels. It includes hands-on experiments, worksheets, and interactive simulations.</p> <p>YouTube: Numerous educational channels on YouTube provide video tutorials on electrical circuits. Some popular channels include "ElectroBOOM" and "Afrotechmods," which offer entertaining and informative videos explaining various concepts and demonstrating circuit building.</p> <p>Remember to adapt the resources to suit the specific level and needs of your students. These references should serve as a good starting point for teaching basic electrical circuits.</p>	Yes

<b>Recommended Texts</b>	All of above	Yes
<b>Websites</b>	<a href="https://www.uoanbar.edu.iq/Bank-Section.php">https://www.uoanbar.edu.iq/Bank-Section.php</a>	

<b>Grading Scheme</b> مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - 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 (0 – 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work 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.