Ministry of Higher Education and

Scientific Research - Iraq

Al-Mustaqbal University

College of Engineering Technique

Department of Electrical Engineering Technique

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**AC ELECTRICAL CIRCUITS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** **Practical** ✓ **Seminar**	
Module Code	UOMU0205021		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	**Semester of Delivery**	2
Administering Department	DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES	**College**	Al-Mustaqbal University
Module Leader		**e-mail**	
Module Leader's Acad. Title	Assist. lecturer	**Module Leader's Qualification**	Master
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	14/06/2023	**Version Number**	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	**EET100**	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1-Understand the fundamental concepts and principles of alternating current (AC) circuits. 2-Gain knowledge of the mathematical tools and techniques used to analyze AC circuits, including phasors, complex numbers, and impedance. 3-Develop the ability to solve AC circuit problems using circuit analysis techniques such as mesh analysis, nodal analysis, and Thevenin's theorem.. ect. 4-Learn how to calculate and analyze voltage and current phasors in AC circuits, including their amplitudes, phases, and frequency relationships. 5-Explore the behavior and characteristics of AC circuit elements, such as resistors, capacitors, and inductors, and understand their roles in AC circuit analysis.

	6-Investigate the concept of impedance in AC circuits and its relationship to resistance, reactance, and frequency. 7-Study the principles of AC power and power factor, including real power, reactive power, apparent power, and power factor correction. 8- Gain a comprehensive understanding of three-phase AC systems, including the generation, transmission, and distribution of power in three-phase circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Knowledge Acquisition: Students will acquire a comprehensive understanding of the fundamental concepts and principles of alternating current (AC) circuits. 2-Circuit Design and Analysis: Students will gain the ability to design and analyze AC circuits, applying their knowledge of impedance, power factor, and component characteristics. They will learn to calculate voltage and current magnitudes, phase differences, and power relationships in AC circuits. 3-Phasor Diagram Interpretation: Students will be able to construct and interpret phasor diagrams to visualize and analyze the behavior of voltages and currents in AC circuits. 4-Three-Phase Systems: Students will acquire understanding of three-phase AC systems, including balanced and unbalanced configurations. Laboratory Skills: Students will develop practical skills in using circuit simulation software and laboratory equipment to design, analyze, and verify the performance of AC circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Part A – Inductance & Capacitance in Electric circuits. General concept of capacitance (charge and voltage, capacitors in series and parallel) General concept of inductance (inductive and non-inductive circuits, capacitors in series and parallel) [4 hrs] • Part B Alternating Quantities. Ac systems, waveforms, terms and definitions. Average and R.M.S values of current and voltage. [8 hrs] • Part C Single - phase of AC Circuits. AC in resistive circuits, current and voltage in inductive circuits, current and voltage in capacitive circuits. Concept of complex impedance and admittance, AC series and parallel circuits. RL, RC and RLC circuit analysis and phasor representation. [14 hrs] • Part D Power in AC circuits. Power in resistive circuits. power in inductive and capacitive circuits ,power in circuit with resistance and reactance. Power factor, its practical importance, improvement of power factor, measurement of power in a single – phase AC circuits. [8 hrs] • Part E Three – phase circuit analysis. Basic concept and advantages of three – phase circuit. Phasor representation of star and delta connection. Phase and line quantities. Voltage and current computation in 3-phase balance and unbalance circuits. Real and Reactive power computation, measurement of power and power factor in 3-phase system. [20 hrs] • Revision problem classes [6 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	1-Conceptual Understanding: Explain the differences between AC and DC circuits, introduce the concept of impedance, reactance, and phasors, and highlight the significance of frequency and phase in AC circuits. 2-Mathematical Foundations: Provide a solid mathematical foundation for AC circuits. Teach students the use of complex numbers and phasor notation to analyze AC circuits. 3-Problem-Solving Skills: Dedicate adequate time to problem-solving exercises and examples. 4-Laboratory Experiments: Incorporate laboratory experiments to reinforce theoretical concepts. Allow students to build and analyze AC circuits using oscilloscopes, function generators, and AC power sources. 5-Simulation Tools: Introduce simulation software tools that allow students to simulate AC circuits and observe their behavior. 6-Review and Assessment: Regularly review key concepts and provide formative assessments to gauge students' understanding. Offer constructive feedback on their performance to help them identify areas for improvement.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.12
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
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**	6	10% (10)	5, 10	, 2, 4
	Assignments	6	10% (10)	2, 12	1, 3,
	Projects / Lab.	9	10% (10)	Continuous	All
	Report	12	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO # 1-4
	Final Exam	3 hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
1,2,3,4,5,6	AC circuits with steady-state sinusoidal excitation: Basic concepts of frequency, angular frequency, phase shift, amplitude, peak, peak-to-peak, and root-mean-square values. Mathematical representation of sinusoidal voltages and currents, phasor representation of alternating voltages and currents, complex number representation of voltage and current phasors, the j operator and its application in circuit

	analysis. Complex impedance, admittance, resistance, reactance, conductance and susceptance. Solution of simple circuits by combining impedances in series and parallel. General circuit analysis using j notation. Resonance: Analysis and applications of series and parallel resonant circuits, bandwidth and Q factor.
7,8,9	AC power absorbed by a resistor, inductor and capacitor. Relationships between power, reactive power and VA, power factor, principle of conservation of power and reactive power, reactive power absorbed by capacitors and inductors, power factor correction, complex power in terms of phasor voltages and currents.
10,11	Poly phase and three phase system , Delta connection, Wye connection.
12,13	The power in balance phase circuit. Unbalance Wye and delta connected load, the rotating magnetic field.
14	Magnetically coupled circuits.
15	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
1	Lab.1:Operating of oscilloscope (CRO)
2	Lab.2:Utilization of oscilloscope for measuring voltage (The Sine wave)and calculate average, RMS value and time period.
3	Lab.3: Alternating voltage applied in a pure resistance circuit.
4	Lab.4: Alternating voltage applied in a pure inductive circuit.
5	Lab.5: Alternating voltage applied in a pure capacitive circuit.
6	Lab.6: Series R-L circuit
7	Lab.7: Series R-C circuit
8	Lab.8: Series R-L-c circuit
9	Lab.9: Parallel R-L circuit
10	Lab.10: Parallel R-C circuit
11	Lab.11: Parallel R-L-C circuit
12	Lab.12: Balanced 3-phase circuit star connection
13	Lab.13: Balanced 3-phase circuit delta connection.
14	Lab.14: Unbalanced 3-phase circuit star connection

15	Lab.15: review

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Charles K. Alexander, Matthew N.O. Sdiku Fundamentals of Electrical Engineering, 4th Edition, 2009	Yes
Recommended Texts	Tony R. Kuphaldt, Lessons In Electric Circuits, Volume II - AC 5th edition, 2002	No
Websites	AC circuits https://byjus.com/physics/ac-circuit/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.