



Ministry of Higher Education and
Scientific Research - Iraq
Alayen Iraqi University
College of Engineering
Department of Artificial Intelligence
Engineering



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Electrical Circuits		Module Delivery	
Module Type	Core	☒ Theory ☐ Lecture ☒ Lab xTutorial ☐ Practical ☐ Seminar		
Module Code	ENG113			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	UGI			Semester of Delivery
Administering Department	BSc – COMM	College	College of Engineering & Information Technology	
Module Leader	Nour Al-Huda Salam Khalil		e-mail	
Module Leader's Acad. Title	Assist. Lecturer		Module Leader's Qualification	MSC
Module Tutor			e-mail	
Peer Reviewer Name	-		e-mail	
Scientific Committee Approval Date			Version Number	1.0



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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 Objectives أهداف المادة الدراسية	1. This course deals with the basic concept of electrical circuits. 2. This is the basic subject for all electrical and electronic circuits. 3. To understand voltage, current and power from a given circuit. 4. To develop problem solving skills and understanding of circuit theory through the application of techniques. 5. To understand Kirchhoff's current and voltage Laws problems. 6. To perform mesh and Nodal analysis. 7. To perform Maximum Power Transfer and reciprocity theorems 8. To understand Magnetic Circuits
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how electricity works in electrical circuits. 2. List the various terms associated with electrical circuits. 3. Summarize what is meant by a basic electric circuit. 4. Discuss the reaction and involvement of atoms in electric circuits. 5. Describe electrical power, charge, and current. 6. Define Ohm's law. 7. Identify the basic circuit elements and their applications. 8. Discuss the operations of sinusoid and phasors in an electric circuit. 9. Discuss the various properties of resistors, capacitors, and inductors. 10. Explain the two Kirchhoff's laws used in circuit analysis. 11. Identify the capacitor and inductor phasor relationship with respect to voltage and current. 12. Understanding Maximum Power Transfer and reciprocity theorems 13. Understanding Magnetic Circuits
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.



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Part A - Basic Concepts

Introduction, Systems of Units, Charge and Current, Voltage, Power and Energy, Circuit Elements [18 hrs]

Part B - Basic Laws

Ohm's Law, Nodes, Branches, and Loops, Kirchhoff's Laws, Series Resistors and Voltage Division, Parallel Resistors and Current Division, Wye-Delta Transformations. [15 hrs]

Part C - Methods of Analysis

Nodal Analysis, Nodal Analysis with Voltage Sources, Mesh Analysis, Mesh Analysis with Current Sources [12 hrs]

Part D - Circuit Theorems

Superposition, Source Transformation, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer [24 hrs]
Revision problem classes [6 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

1. Behavior management

Behavior management strategies foster an atmosphere of mutual respect, reduce disruptive behavior and ensure students have an equal opportunity to fulfill their potential in the classroom. It's crucial to provide them with both a positive and productive learning environment. Examples include establishing a reward system with an interactive chart where students move up or down depending on their performance and behavior in class.

2. Blended learning

With a blended learning teaching strategy, technology is incorporated with traditional learning. This allows students to work at their own pace, research their ideas and become more physically engaged during lessons. Examples include providing interactive tablets or whiteboards with engaging activities and posting classwork online for easier access.

3. Cooperative learning

Group work is a cooperative learning strategy that allows students with various learning levels to work together. By encouraging them to express their own ideas and listen to others' ideas as a group, you help students develop communication and critical thinking



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skills. Examples include solving math puzzles together, performing skits as a team or working on group presentations.

4. Formative assessment

A formative assessment is used periodically to monitor student learning incrementally. This can more effectively measure the process of learning as opposed to end-of-unit tests and can help you to improve your teaching methods throughout the year. Examples of this teaching strategy include self-evaluation exercises and summarizing a topic in multiple ways.

5. Student-led teaching

The student-led teaching strategy lets students become the teacher. In a classroom with learners at different levels, you can better engage those learning faster by showing them how to teach and give feedback to their peers. They may team-teach or work in groups to teach a new topic. Examples include letting a student teach an entire lesson or having advanced writers lead a peer-editing session as well as provide constructive criticism.

Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	71	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5.1
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 12	LO #1, #4 and #8, #11
	Assignments	2	10% (10)	3 and 13	LO #3, #4 and #10, #14
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	14	LO #5, #8 and #10
	Midterm Exam	2hr	10% (10)	8	LO #1 - #7



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Summative assessment	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المناهج الاسبوعي النظري

	Material Covered
Week 1	- Electrical Engineering: An Overview - The International System of Units conversions (metric prefixes) - Free electrons, electric charge & types of electric materials - Definition of: electric current, electric current flowing through a conductor, electric voltage
Week 2	- Polarity of electric voltage across an element - The difference between electric potentials and electric voltage - Linear and non-linear elements: resistances, conductance, capacitances, and inductances - Definition of: Power and energy, Sources (Independent Source & Dependent Source)
Week 3	- Ohm's Law - Definition of: Nodes, Branches, and Loops
Week 4	- Series & parallel connections of resistors - Series Resistors and Voltage Division - Parallel Resistors and Current Division
Week 5	- Short and Open Circuits - Star-Delta Transformations
Week 6	Kirchhoff's Laws
Week 7	Methods of Analysis: Nodal Analysis
Week 8	Mid-term Exam
Week 9	Methods of Analysis: Mesh Analysis
Week 10	Circuit Theorems: Superposition, Source Transformation
Week 11	Circuit Theorems: Source Transformation
Week 12	Circuit Theorems: Thevenin's Theorem
Week 13	Circuit Theorems: Norton's Theorem, Derivations of Thevenin's and Norton's Theorems
Week 14	Circuit Theorems: Maximum Power Transfer Theorem



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	• Millman's Theorem, Substitution Theorem, Reciprocity Theorem
Week 15	• Magnetic Circuits: Definitions, Composite Series Magnetic Circuit, Ampere-turns , Comparison Between Magnetic and Electric Circuits, Parallel Magnetic Circuits, Series-Parallel Magnetic Circuits, Leakage Flux and Hopkinson's Leakage Coefficient, Magnetization Curves.
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction to Lab. Equipment's and How to use Avometer
Week 2	Lab 2: How to measure DC Voltage, current, power and resistor
Week 3	Lab 3: Resistor Color Code
Week 4	Lab 4: Ohm's Law
Week 5	Lab 5: Series, parallel and series- parallel circuits
Week 6	Lab 6: Star-Delta Transformations
Week 7	Lab 7: Kirchhoff's Voltage and Current Laws
Week 8	Lab 8: Nodal Analysis
Week 9	Lab 9: Mesh Analysis
Week 10	Lab 10: Superposition theorems
Week 11	Lab 11: Thevenin's theorems
Week 12	Lab 12: Norton's theorems
Week 13	Lab 13: Maximum Power Transfer Theorem
Week 14	Lab 14: Composite Series Magnetic Circuit
Week 15	Final Exam

Learning and Teaching Resources

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مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- Theraja, B. L. A Textbook of Electrical Technology-Volume I (Basic Electrical Engineering). Vol. 1. S. Chand Publishing, 2005. - C.K. Alexander and M.N.O Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education, Fifth Edition, 2013	Yes
Recommended Texts	- Allan H. Robbins and Wilhelm C. Miller, Circuit analysis: Theory and practice, Cengage Learning, Fifth Edition, 2013. - Nilsson, James William, Electric circuits, Pearson Education India, 2008.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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.