	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa College of Engineering Aircraft Engineering Department	

MODULE DESCRIPTOR FORM

Module Information

Module Title	Electrical Engineering		**Module Delivery**	
Module Type	CORE			
Module Code	ENG125			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	1		**Semester of Delivery**	2
Administering Department	Aircraft Engineering		**College**	Engineering
Module Leader	Ahmed Mohamed Merza		**e-mail**	ahmed.merza@uowa.edu.iq
Module Leader's Acad. Title	Assist. Lec.		**Module Leader's Qualification**	MSc.
Module Tutor	None		**e-mail**	None
Peer Reviewer Name			**e-mail**	
Review Committee Approval	26/09/2024		**Version Number**	2024

Theory
Lab

Relation With Other Modules

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

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. To develop problem solving skills and understanding of circuit theory through the application of techniques. 2. To understand how voltage, current and power from a given circuit. 3. This course deals with the basic concept of electrical circuits. 4. This is the basic subject for all electrical and electronic circuits subject. 5. To understand Kirchhoff's current and voltage Laws problems. 6. To perform mesh and Nodal analysis.
Module Learning Outcomes	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 Kirchoff's laws used in circuit analysis. 11. Identify the capacitor and inductor phasor relationship with respect to voltage and current.
Indicative Contents	Indicative content includes the following. <u>Part A - Circuit Theory</u> DC circuits – Current and voltage definitions, Passive sign convention and circuit elements, Combining. resistive elements in series and parallel. Kirchhoff's laws and Ohm's law. Anatomy of a circuit, Network reduction, Introduction to mesh and nodal analysis . [8hrs] AC circuits I – Time dependent signals, average and RMS values. Capacitance and inductance, energy storage elements, simple AC steady-state sinusoidal analysis. [8 hrs] AC Circuits II - Phasor diagrams, definition of complex impedance, AC circuit analysis with complex numbers. [6 hrs]

	RL, RC and RLC circuits - Frequency response of RLC circuits, simple filter and band-pass circuits, resonance and Q-factor, use of Bode plots, use of differential equations and their solutions. Time response (natural and step responses). Introduction to second order circuits. [8 hrs] Revision problem classes [3 hrs] <u>Part B - Analogue Electronics</u> Fundamentals Resistive networks, voltage and current sources, Thevenin and Norton equivalent circuits, current and voltage division, input resistance, output resistance, coupling and decoupling capacitors, maximum power transfer, RMS and power dissipation, current limiting and over voltage protection. [8 hrs] Components and active devices – Components vs elements and circuit modeling, real and ideal elements. Introduction to sensors and actuators, self-generating vs modulating type sensors, simple circuit interfacing. [3 hrs] Diodes and Diode circuits – Diode characteristics and equations, ideal vs real. Signal conditioning, clamping and clipping, rectification and peak detection, photodiodes, LEDs, Zener diodes, voltage stabilisation, voltage reference, power supplies. [8 hrs]
Learning and Teaching Strategies	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem)	48	**Structured SWL (h/w)**	3

Unstructured SWL (h/sem)	52	**Unstructured SWL (h/w)**	3.5
Total SWL (h/sem)	100		

Module Evaluation

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	3, 6, 9, 12	LO #1-11
	Assignments	2	10% (10)	5, 10	LO #1-11
	Projects / Lab.	Lab. 7	10% (10)	Continuous	LO #1, 2, 3, 6, 7, 8, 9, 10, 11
	Report	-	-	-	-
Summative assessment	**Midterm Exam**	2 hrs.	10% (10)	7	LO #1-11
	Final Exam	3 hrs.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to DC Circuits: Voltage, Current and Resistance. Ohm's Law. Kirchhoff's Laws. Voltage divider rule. Current divider rule. Current and Voltage Sources.
Week 2	Sources conversion. Series and Parallel Circuits. Star-delta and delta-star conversion. Methods of Analysis and Network Theorems: Branch-Current Analysis.
Week 3	Mesh Analysis. Nodal Analysis. Superposition Theorem. Thévenin's Theorem. Norton's Theorem.
Week 4	Maximum Power Transfer. Capacitors and Inductors: Capacitance and Capacitors
Week 5	Inductor and Inductance. Sinusoidal Alternating Waveforms:

	AC Voltage or Current Waveform General Format.
Week 6	Sinusoidal Waveform Format (period, Frequency, peak value and Phase Relations). Average Value and Effective (rms) Values. The Basic Elements (R, L, and C) response to a sinusoidal voltage or current.
Week 7	Magnetic Circuits: Magnetic Field, Flux and flux density. Reluctance and Magnetizing Force.
Week 8	Ohm's Law for Magnetic Circuits. Ampère's Circuital Law.
Week 9	AC Circuits Analysis: Series and Parallel AC Circuits. Power calculation (P, Q, and S).
Week 10	Power Triangle. Power-Factor. Polyphase Systems:
Week 11	Three-phase voltage generation. Generator-Loads connection in three phase systems (Y-Y,Δ-Δ,Y-Δ,Δ-Y). Phase and line voltage and current convertion between Y and Δ.
Week 12	Rotating Machines Principles: Elementary concepts of rotating machines. Direct –current machines. Synchronous machines.
Week 13	Induction machine. Stepper motor. Transformers: Construction and Working principle of transformer.
Week 14	E.M.F. equation of transformer. Voltage transformation ratio. Types of Transformers and Application
Week 15	**Power Electronic Circuits:** **Power electronic elements (dides, switching transistors , Capacitors and Inductor).** **Power electronic circuits (Rectifiers, inverters, converters).**
Week 16	**Preparatory week before the Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Exp. 1: Ohm's Law
Week 2	Exp. 2: Kirchhoff's Laws
Week 3	Exp. 3:Star-Delta and Delta-Star Circuit conversions
Week 4	Exp. 4:Superposition Theorem
Week 5	Exp. 5: Impedance Elements Characteristics

Week 6	Exp. 6: RLC Series Circuit
Week 7	Exp. 7:

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Robert L. Boylestad "Introductory Circuit Analysis" Eleventh Edition	Yes
Recommended Texts	John Hiley, Keith Brown and Ian Mckenzie Smith "Electrical And Electronic Technology" tenth edition	Yes
Websites		

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.