MODULE DESCRIPTION FORM

Module Information					
Module Title	**Electrical Circuits**			**Module Delivery**	
Module Type	**Basic**			☑ **Theory** ☑ **Lecture** ☑ **Lab** ☑ **Tutorial** ☑ **Practical** ☐ **Seminar**	
Module Code	**LAER110**				
ECTS Credits	**5**				
SWL (hr/sem)	**95 H/Sem.**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Laser &		**College**	College of Engineering	
Module Leader	MOAMEL ALWAN		**e-mail**	alwanmoamel@gmail.com	
Module Leader's Acad. Title	Master.		**Module Leader's Qualification**	Master.	
Module Tutor	Zahraa Hussein Najm		**e-mail**	zahraa2003hhhooo@gmail.com	
Peer Reviewer Name	Hasnaa Mohamed		**e-mail**	Hasnaa.mohammad@alayen.edu.iq	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	MDER 110	**Semester**	1
Co-requisites module	MDER 120	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. To define and explain the fundamental concepts of sinusoidal AC waveforms, impedance, phasors, and the behavior of R, L, and C elements in AC circuits. 2. • analyze AC circuit techniques, including complex numbers, mesh and nodal analysis, source conversion, and delta–star transformations in solving circuit problems. 3. • To design and evaluate AC circuits by assessing power components (P, Q, S), power factor, and overall circuit performance using appropriate analytical methods.

Module Learning outcomes	A	A 2	A2.1: Define the Sinusoidal Alternating Waveforms A 2.2 Memorize, Sinusoidal AC Voltage Characteristics and Definitions A 2.3 Understand the General Format for the Sinusoidal Voltage or Current. And Phase Relations,Average Value Effective (RMS) Value A2.4 Classify the rules and circuit A 2.5: Explain the operation of series, parallel, and series-parallel DC And AC circuits, applying Kirchhoff's Laws, voltage divider, and current divider rules. A 2.6 Use the Rules (• Source Conversions (AC),Mesh Analysis (AC),Nodal Analysis (AC),Bridge Networks (AC)and Delta–Star and Star–Delta Conversions)
		A 3	A 3.1 Name of the basic device for Ac A 3.2 Explain the device and circuit.(Ac principles, including , Kirchhoff's Laws, Source Conversions , and Nodal Analysis) A 3.3 Apply circuit analysis methods, rules, and theorems A3.4 Calculate the experimental result
	B	B2	B.2.1 Communicate effectively – graphically with a range of audiences using contemporary tools. B.2.2 Communicate verbally and in writing with a range of audiences using contemporary tools.
		B3	B.3.1 Acquire and apply new knowledge. B.3.2 Practice the strategies of searching for information in life – long self- learning

	C	C1	C.3.1 Utilize contemporary technologies C.3.2 Make use of codes of practice and standards, quality guidelines, C.3.3 Utilize health and safety requirements C.3.4 C.3.4 Show environmental issues and risk management principles.

Indicative Contents

Part A – Sinusoidal Fundamentals and Mathematical Tools (16 hrs)

- Sinusoidal Alternating Waveforms
- Sinusoidal AC Voltage Characteristics and Definitions
- The Sine Wave
- General Format for the Sinusoidal Voltage or Current
- Phase Relations
- Average Value
- Effective (RMS) Value
- Complex Numbers
- Rectangular Form
- Polar Form

(8 hrs + 8 hrs)

Part B – AC Circuit Response and Network Analysis (24 hrs)

- Response of Basic R, L, and C Elements to a Sinusoidal Voltage or Current (8 hrs)
- Series AC Circuits, Impedance and Phasor Diagram, Series Configuration (8 hrs)
- Parallel AC Networks (4 hrs)
- Series–Parallel AC Networks with Illustrative Examples (4 hrs)

Total = 24 hrs

Part C – AC Analysis Methods and Power (20 hrs)

- Methods of Analysis (AC)
- Source Conversions
- Mesh Analysis (8 hrs)
- Nodal Analysis
- Bridge Networks (AC)
- Delta–Star Conversions (8 hrs)
- Power in AC
- Apparent Power
- Inductive Circuits and Reactive Power (4 hrs)
- Power Triangle
- Total P, Q, and S
- Power Factor (8 hrs)

- Total = 20 hrs

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري		
	Material Covered	**LOs**
Week 1	Introduction to Sinusoidal Alternating Waveforms and Basic Definitions	**A2.1**
Week 2	The Sine Wave and General Mathematical Form of Sinoidal	**A2.1,A2.2**
Week 3	Phase Relations, Average and RMS Values	**A 2.1-A2.4**
Week 4	Complex Numbers – Rectangular and Polar Forms and Conversions	**A2.1-A2.4**
Week 5	Response of Pure Resistive Circuits (R)	**A2.1-A2.4,B,C**
Week 6	Response of Pure Inductive (L) and Capacitive (C) Circuits	**A2.1-A2.4A,2.5,B,C**
Week 7	AC Circuits Sinusoidal Steady-State Analysis	**A2.2,A2.3,A2.4,B,C**
Week 8	Impedance Concept and Phasor Representation	**A2.2,A2.3,A2.4,B,C**
Week 9	MID EXAM	**A2**
Week 10	Series and Parallel AC Circuits	**A2.1-A2.5,B,C**
Week 11	Source Conversion and Mesh Analysis (AC)	**A2.1-A2.5,B,C**
Week 12	Nodal Analysis and Bridge Networks (AC)	**A2.1-A2.5,B,C**
Week 13	AC Network Theorems: Superposition Theorem	**A2.1-A2.5,B,C**
Week 14	Delta–Star and Star–Delta Conversions	**A2.1-A2.6,B,C**
Week 15	Power in AC Circuits – P, Q, S and Power Factor	**A2.1-A2.6,B,C**
Week 16	The final Exam	**A2**

Learning and Teaching Strategies	
Strategies	• Presentations • Brainstorm • Tutorial and graphics • Problem solving • Research and reporting • Problem Solving • Report & discussion assessment

Student Workload (SWL)			
Structured SWL (h/sem)	62	**Structured SWL (h/w)**	4.13
Unstructured SWL (h/sem)	33	**Unstructured SWL (h/w)**	2.2
Total SWL (h/sem)	95		

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر		
	Material Covered	**LOs**
Week 1	Measurement of Sinusoidal Waveforms and RMS Value	**A 3.1**
Week 2	Introduction to AC Lab Instruments (Function Generator, Oscilloscope, AC Voltmeter, Multimeter)	**A3.2-3.4**
Week3	Phase Difference Measurement using Oscilloscope	**A3.2-3.4**
Week 4	Verification of Impedance in Pure Resistive Circuit (R)	**A3.2-3.4,B,C**
Week 5	Response of Inductive Circuit (L)	**A3.2-3.4B,C**
Week6	Response of Capacitive Circuit (C)	**A3.2-3.4B,C**
Week7	Mesh Analysis Method	**A3.2-3.4 B,C**
Week 8	Series–Parallel AC Network Analysis	**A3.2-3.4,B,C**
Week 10	Verification of Nodal Analysis in AC Circuits	**A3.1,A3.5,B,C**
Week 11	Delta–Star Conversion Experiment	**A3.1,A3.5,B,C**
Week 12	Measurement of Average Power and Power Factor	**A3.1,A3.5,B,C**
Week13	Power Triangle Verification (P, Q, S)	**A3.1,A3.5,B,C**
Week14		**A3.1,A3.5,B,C**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Charles K. Alexander and Matthew N.O. Sadiku, Fundamentals of Electric Circuits	Yes
Recommended Texts	Boylestad, R. L., & Nashelsky, L. Electronic Devices and Circuit Theory (11th ed.). Pearson	No
Websites	https://eng.alayen.edu.iq//colleges/e/42	

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.