



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	<b>ADVANCED ELECTRICAL CIRCUITS ANALYSIS</b>		Module Delivery
Module Type	CORE	✓ Theory Lecture ✓ Lab Tutorial ✓ Practical ✓ Seminar	
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	2
Administering Department	<b>DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES</b>	College	<b>UOMU025043</b>
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name	None	e-mail	None
Review Committee Approval		Version Number	1.0

## Relation With Other Modules

### العلاقة مع المواد الدراسية الأخرى

Prerequisite module	<b>ELECTRICAL CIRCUITS ANALYSIS</b>	Semester	2
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	<b>Students will learn the principle of ;</b> <b>1. Write circuit first order and second order equations for coupled system</b> <b>2. Analyze circuits containing ideal transformers</b> <b>3. Derive two port parameter descriptions for circuits.</b>
Module Learning Outcomes	1-Knowledge Acquisition: Students will acquire a comprehensive understanding of the fundamental concepts and principles of <b>Write circuit first order and second</b>

<p>مخرجات التعلم للمادة الدراسية</p>	<p><b>order equations circuit</b></p> <p>2-Circuit Design and Analysis: Students will gain the ability to design and analyze Resonance A.c and Dc circuit heir 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.</p> <p>3-Analyze circuits containing ideal transformers(Laplas transformation and Fourier transformation)</p> <p>4-Hybrid Systems: Students will acquire understanding of hybrid tow port net work systems, including balanced and unbalanced configurations.</p> <p>Laboratory Skills: Students will develop practical skills in using circuit simulation software and laboratory equipment to design, analyze, and verify the performance of different circuits.</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following:</p> <ul style="list-style-type: none"> <li>● <u>Part A – Application of laplace transform to circuit analysis.</u> Solve the second order differential equation using laplas transformation and Application of Laplace transform to circuit analysis. [6 hrs]</li> <li>● <u>Part B – Frequency selective circuits</u> Design the passive and active filter select the correct frequency for design [4 hrs]</li> <li>● <u>Part C Transient analysis in DC circuit.</u> Source free and step response RL and RC circuits in DC system. Comoplet response of a series and a parallel RLC circuits in DC system. [10 hrs]</li> <li>● <u>Part D Sinusoidal frequency analysis.</u> 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]</li> <li>● <u>Part E Two-port networks and Hybrid parameter</u> Two-port networks: (impedance, admittance, transmissions parameters, relationships between parameters, interconnection between networks).  [14 hrs]</li> </ul>

<p><b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم</p>	
<p><b>Strategies</b></p>	<p>1-Conceptual Understanding: Explain transient AC and DC circuits, introduce the concept of complete response of RLC circuit, and highlight the significance of RLC series and parallel circuit and phases in AC circuits.</p> <p>2-Mathematical Foundations: Provide a solid mathematical foundation for transient DC and AC circuits. Teach students the use of LAPLAS Transformation to analyze circuits.</p> <p>3-Problem-Solving Skills: Dedicate adequate time to problem-solving exercises and examples.</p> <p>5-Simulation Tools: Introduce simulation MATLAB software tools that allow students to simulate circuits and observe their behavior.</p> <p>6-Review and Assessment: Regularly review key concepts and provide formative assessments to gauge students' understanding. Offer constructive feedback on</p>

their performance to help them identify areas for improvement.

### Student Workload (SWL)

الحمل الدراسي للطالب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	5.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	4	10% (10)	3-10	LO #3, 2and 4
	<b>Assignments</b>	6	10% (10)	2-12	LO # 3, 4
	<b>Projects / Lab.</b>	2	10% (10)	3,7	LO # 2,3
	<b>Report</b>	16	10% (10)	continuous	LO # 1,4
<b>Summative assessment</b>	<b>Midterm Exam</b>	1 hr	10% (10)	8	LO # 1-4
	<b>Final Exam</b>	3 hr	50% (50)	15	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Material Covered	
<b>Week 1</b>	Sinusoidal steady- state analysis (Kirchhoff's laws, Mesh analysis, Nodal analysis, Superposition's theorem, Thevenin's theorem, Norton's theorem, source transformations).
<b>Week 2</b>	Balanced three-phase circuits: (wye –wye, delta-delta, connections).
<b>Week 3,4</b>	Balanced three-phase circuits: (wye-delta, delta-wye connections).
<b>Week 5</b>	Unbalanced three phase system
<b>Week 6,7</b>	Frequency selective circuits: <ul style="list-style-type: none"> <li>• Passive filters</li> <li>• Active filters</li> </ul>
<b>Week 8</b>	Advanced circuit analysis using Laplace transform.
<b>Week 9,10</b>	Application of Laplace transform to circuit analysis.

<b>Week 11,12</b>	Two-port networks: (impedance, admittance, transmissions parameters, relationships between parameters, interconnection between networks).
<b>Week 11</b>	Hybrid parameter of two port(H-parameters), Inverse hybrid parameters
<b>Week 12</b>	Final Examination

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Lab 1: simulation of the sinusoidal steady state system
<b>Week 2</b>	Lab 2: simulation The sinusoidal transient analysis
<b>Week 3</b>	Lab 3:simulation of three phase star to star connection
<b>Week 4</b>	Lab 4: simulation of three phase delta to delta connection
<b>Week 5</b>	Lab 5: simulation of three phase star to delta connection
<b>Week 6</b>	Lab 6: simulation of three phase delta to star connection
<b>Week 7</b>	Lab 7: simulation of Unbalanced three phase system in different phase voltage
<b>Week 8</b>	Lab 8: simulation of Unbalanced three phase system in different phase frequency
<b>Week 9</b>	Lab 9: design passive filter in MATLAB program
<b>Week 10</b>	Lab 10: design active filter in MATLAB program
<b>Week 11,12</b>	Lab 11: design Two-port networks impedance in MATLAB program
<b>Week 13</b>	Lab 12: design hybrid of Two-port networks in MATLAB program
<b>Week 14</b>	Lab 14: Review

### Learning and Teaching Resources

مصادر التعلم والتدريس

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

#### APPENDIX:

### GRADING SCHEME

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
-------	-------	---------	-----------	------------

<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	مقبول بقرار	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	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.