Ministry of Higher Education and
Scientific Research - Iraq
Al-Furat Al-Awsat Technical University
Technical College /Al-Mussaib
Department of Electrical Engineering Techniques

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	**ADVANCED ELECTRICAL CIRCUITS ANALYSIS**	**Module Delivery**	
Module Type	CORE	✓ **Theory** **Lecture** ✓ **Lab** **Tutorial** ✓ **Practical** ✓ **Seminar**	
Module Code	ATU23043		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	٢	**Semester of Delivery**	2
Administering Department	**DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES**	**College**	Al-Furat Al-Awsat Technical University Technical College /Al-Mussaib
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	13/06/2023	**Version Number**	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	**ELECTRICAL CIRCUITS ANALYSIS**	**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	**Students will learn the principle of ;** ١. **Write circuit first order and second order equations for coupled system** ٢. **Analyze circuits containing ideal transformers** ٣. **Derive two port parameter descriptions for circuits.**
Module Learning Outcomes	١-Knowledge Acquisition: Students will acquire a comprehensive understanding of the fundamental concepts and principles of **Write circuit first order and second order equations** circuit ٢-Circuit Design and Analysis: Students will gain the ability to design and analyze

مخرجات التعلم للمادة الدراسية	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. ٣-Analyze circuits containing ideal transformers(Laplas transformation and Fourier transformation) ٤-Hybird Systems: Students will acquire understanding of hybrid tow port net work 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 different circuits.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: ● Part A – Application of laplace transform to circuit analysis. Solve the second order differential equation using laplas transformation and Application of Laplace transform to circuit analysis. [6 hrs] ● Part B – Frequency selective circuits Design the passive and active filter select the correct frequency for design [4 hrs] ● Part C Transient analysis in DC circuit. 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] ● Part D Sinusoidal frequency analysis. 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 E Two-port networks and Hybrid parameter Two-port networks: (impedance, admittance, transmissions parameters, relationships between parameters, interconnection between networks). [14 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	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. 2-Mathematical Foundations: Provide a solid mathematical foundation for transient DC and AC circuits. Teach students the use of LAPLAS Transformation to analyze circuits. 3-Problem-Solving Skills: Dedicate adequate time to problem-solving exercises and examples. 5-Simulation Tools: Introduce simulation MATLAB software tools that allow students to simulate 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	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
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**	4	10% (10)	3-10	LO #3, 2and 4
	Assignments	6	10% (10)	2-12	LO # 3, 4
	Projects / Lab.	2	10% (10)	3,7	LO # 2,3
	Report	16	10% (10)	continous	LO # 1,4
Summative assessment	**Midterm Exam**	1 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
Week 1	Sinusoidal steady- state analysis (Kirchhoff's laws, Mesh analysis, Nodal analysis, Superposition's theorem, Thevenin's theorem, Norton's theorem, source transformations).
Week 2	Balanced three-phase circuits: (wye –wye, delta-delta, connections).
Week 3,4	Balanced three-phase circuits: (wye-delta, delta-wye connections).
Week 5	Unbalanced three phase system
Week 6,7	Frequency selective circuits: • Passive filters • Active filters
Week 8	Advanced circuit analysis using Laplace transform.
Week 9,10	Application of Laplace transform to circuit analysis.
Week 11,12	Two-port networks: (impedance, admittance, transmissions parameters, relationships between parameters, interconnection between networks).

Week 11	Hybrid parameter of two port(H-parameters), Inverse hybrid parameters
Week 12	Final Examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: simulation of the sinusoidal steady state system
Week 2	Lab 2: simulation The sinusoidal transient analysis
Week 3	Lab 3:simulation of three phase star to star connection
Week 4	Lab 4: simulation of three phase delta to delta connection
Week 5	Lab 5: simulation of three phase star to delta connection
Week 6	Lab 6: simulation of three phase delta to star connection
Week 7	Lab 7: simulation of Unbalanced three phase system in different phase voltage
Week 8	Lab 8: simulation of Unbalanced three phase system in different phase frequency
Week 9	Lab 9: design passive filter in MATLAB program
Week 10	Lab 10: design active filter in MATLAB program
Week 11,12	Lab 11: design Two-port networks impedance in MATLAB program
Week 13	Lab 12: design hybrid of Two-port networks in MATLAB program
Week 14	Lab 14: 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 (٥٠ - ١٠٠)	**A** - Excellent	امتياز	٩٠ - ١٠٠	Outstanding Performance
	B - Very Good	جيد جدا	٨٠ - ٨٩	Above average with some errors
	C - Good	جيد	٧٠ - ٧٩	Sound work with notable errors

	D - Satisfactory	متوسط	٦٩ - ٦٠	Fair but with major shortcomings
	E - Sufficient	مقبول	٥٩ - ٥٠	Work meets minimum criteria
Fail Group (٠ – ٤٩)	**FX** – Fail	مقبول بقرار	(٤٩-٤٥)	More work required but credit awarded
	F – Fail	راسب	(٤٤-٠)	Considerable amount of work required

Note:

NB Decimal places above or below ٠,٥ will be rounded to the higher or lower full mark (for example a mark of ٥٤,٥ will be rounded to ٥٥, whereas a mark of ٥٤,٤ will be rounded to ٥٤. 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.