

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Electrical Machines		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MIE21203			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	UGII	Semester of Delivery		3
Administering Department	MIE	College	MUC	
Module Leader	Bassim Abdulbaki		e-mail	bassim.jumaa@muc.edu.iq
Module Leader's Acad. Title	Assist.Prof.Dr		Module Leader's Qualification	Ph.D
Module Tutor			e-mail	
Peer Reviewer Name	Lect.Dr Adel Abbas		e-mail	adel.abas@muc.edu.iq
Scientific Committee Approval Date	8/11/2023		Version Number	1.0

Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	Fundamentals of Electrical Engineering (AC)		Semester	UGI-S2
Co-requisites module	None		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1- Study engineering concepts and their applications for electrical machines and transformers. 2- How electrical transformers work, how to connect them, and solve mathematical problems related to them and their types. 3- What are electrical machines and what are their classifications. 4- Knowledge and understanding of the basics of laws related to electrical technology materials. 5- Solve issues and issues and apply the rules of application related to electrical engineering. 6- Giving students confidence and ability to use mathematical foundations in applications on generators, electric motors. 7- Building interactive skills that help classify information and make engineering decisions. 8- Develop proposals and alternatives for electrical parts for medical devices
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learn how transformers work in electrical circuits. 2. List the various terms associated with electrical circuits and machines. 3. Summarize what is meant by electrical transformers and basic electrical machines of all kinds. 4. Discuss the interaction and participation of the number of windings, wire diameter and size of electrical transformers. 5. Description of electrical transformers, motors and generators with direct current and alternating current. 6. Determine the laws related to electrical transformers and their derivations. 7. Identify the equivalent circuits of electrical transformers and methods of calculating their efficiency. 8. Discuss the processes that lead to losses in transformers and electrical machines, and ways to reduce them and increase their efficiency. 9. Discuss the different characteristics of engines and generators, their main components, and the functioning of each. 10. Explain the two laws of machines and determine their efficiency, capacity and torque, and the laws of their formation. 11. Identify the relationship of transformers and electrical machines to medical devices. 12. Discuss the systems of connecting machines, ways of wrapping coils inside them, and the benefits of each. 13. Determining how to increase the efficiency of motors used in medical devices and methods of maintaining and repairing them. 14. Describe the types of motors included in the formation of medical devices and

	their classification
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Single-phase electrical transformers Types of electrical transformers, their parts and components, their equivalent circuit, types of losses, how to calculate them, and how to calculate transformer efficiency through mathematical operations and efficiency laws. [10 hours] Part B - Three-phase electrical transformers Types of three-phase electrical transformers, calculating their cost, types of connections in their files, calculating their equivalent circuits, and deriving special laws for each connection [13 hours] Part C- Electromagnetic and electromechanical induction and the relationship between them and linear motion using those concepts and applications on linear motion and how to generate it. [10 hours] Part D- The electromotive force of single-phase machines, methods of generating them, their laws, and their calculation through mathematical issues and calculating currents, voltages, losses, and capacity. [10 hours] Part E- The electromotive force of the three-phase machines, methods of generating them, their laws, and their calculation through mathematical problems, types of coil connections, testing those machines, and calculating currents, voltages, losses, and real and apparent power. [15 hours] Instantaneous power and average power of alternating current, relative and apparent power. Types of electric motors and how they work [5 hours] Review problem categories [6 hours]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in the delivery of this unit is to encourage students to participate in the exercises, while improving and expanding their critical thinking skills at the same time. This will be achieved through classes and interactive tutorials and by looking at the types of simple experiments that include some of the electrical wiring activities in the laboratory curriculum that develop students' skills.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	% (10)	5,12	1-3 , 4-10
	Assignments	4	% (10)	4,6,8,12	2-3, 4-5, 6-7, 8-11
	Projects / Lab.	1	% (15)	14	1-12
	Report	5	% (5)	3,5,7,9,11	1-2, 3-4, 5-6, 7-8, 9-10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	1-5
	Final Exam	4 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Transformers : single phase transformer and construction
Week 2	Transformers : single phase transformer and construction
Week 3	Theory of operation, no load and short circuit test.
Week 4	Equivalent circuit, auto-transformers, instrument transformers
Week 5	Equivalent circuit, auto-transformers, instrument transformers
Week 6	Three phase transformers, constructions methods of connection.
Week 7	Mid exam + Three phase transformers, constructions methods of connection.
Week 8	Electromechanical energy conversion principles relay operation.
Week 9	Electromechanical energy conversion principles relay operation.
Week 10	Motor characteristics, testing, calculation of losses and efficiency.
Week 11	Induction machines: equivalent circuit, basic equation, simple analysis testing.
Week 12	Single phase induction motor, methods of starting, split phase, capacitor start, capacitor run and shaded pole motors.
Week 13	Single phase induction motor, methods of starting, split phase, capacitor start, capacitor run and shaded pole motors.
Week 14	Synchronous machines, generators and motors, equivalent circuit, basic equation.
	Special machines: Reluctance motor , hysteresis motor , linear motor , stepper motor , brushless type motor , etc
Week 15	Preparatory week before final exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to measuring devices and identifying wattmeter
Week 2	Characteristics of single-phase electric transformers
Week 3	Open circuit test of transformers
Week 4	Load circuit for single phase transformers
Week 5	Three phase transfer theorem delta- delta
Week 6	Three phase transfer theorem delta- star
Week 7	Three phase transfer theorem star- delta
Week 8	Three phase transfer theorem star- star
Week 9	Characteristics of DC machine
Week 10	load test of three phases (I.M)
Week 11	open circuit test of three phases (I.M)
Week 12	short circuit test of three phases (I.M)
Week 13	Speed control of DC motor + load test of DC generator
Week 14	Series & Shunt DC machine connection. Compound connection of DC machine.
Week 15	Preparatory week before final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Electrical Machines and Drives Fundamentals and Advanced Modelling by Jan A. Melkebeek	Yes
Recommended Texts	Electrical Machines Drives and Power Systems 5th Edition By Theodore Wildi	No
Websites		

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 (فيد 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.				