



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Electric Machines (1) – ERE221

Academic Year	2025/2026	Semester	Spring
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1. Basic Information

Course Title (according to the bylaw)	Electric Machines (1)				
Course Code (according to the bylaw)	ERE221				
Prerequisite:	Electromagnetic Fields – CCE211				
Department/s participating in delivery of the course	Electrical and Renewable Energy Engineering				
Number of credit hours/points of the course (according to the bylaw)	Credit Hours	Contact Hours			
		Lecture	Tutorial	Practical	Total
	3	2	0	2	4
Course Type	Compulsory - Major Requirements of Electrical and Renewable Energy Engineering				
Academic level at which the course is taught	Third Level				
Academic Program	Bachelor of Engineering of Electrical and Renewable Energy				
Faculty/Institute	Faculty of Engineering				
University/Academy	Nahda University				
Name of Course Coordinator	Prof. Dr. Mohamed Mahmoud Samy				
Course Specification Approval:	Department council		Faculty council		
Date of Approval of the course Specification:	13 / 9 / 2025		16 / 9 / 2025		



2. Course Overview

Principle of energy conversion: Electromechanical energy conversion, magnetically single excited systems, magnetically multi-excited systems, Torque and stored energy in magnetic fields, multi-fed rotating systems. DC Machines: the generation of EMF torque, construction of DC machine, the magnetic circuit of the dc machine, armature windings, armature reaction, methods of excitation, load characteristics of dc generators and motors, efficiency, testing of dc machines. Transformers: transformer construction, fundamental laws, equivalent circuits, transformer efficiency, transformer testing, transformer connections and harmonics, auto transformers and tap changers, parallel operation, transformer cooling

3. Course Learning Outcomes CLOs

Matrix of course learning outcomes CLOs with program outcomes POs (NARS/ARS)

Program Outcomes (NARS/ARS) (according to the matrix in the program specs)		Course Learning Outcomes Upon completion of the course, the student will be able to:	
Code	Text	Code	Text
A2	Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.	CLO1	Recognize characteristics of static and energy conversion machines
		CLO2	Carry out lab experiments to analyze the performance of Transformers and DC machines
B2	Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.	CLO3	Analyze the different types of transformers and DC machines
		CLO4	Design of Control circuit of DC machines in Industry
B4	Design and implement elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.	CLO5	Develop simulation to find the characteristics of DC machines using any software packages
D2	Identify, analyze and evaluate the energy's conversion processes and management techniques	CLO6	Develop simulation to find the characteristics of DC machines using any software packages



4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-Learning
3. Discussion
4. Tutorials
5. Field Visits
6. Experimental Learning

Course Schedule

Number of the Week	Scientific content of the course (Course Topics)	Total Weekly Hours	Expected number of the Learning Hours				
			Lecture Hours	Tutorial Hours	Practical Hours	Self-learning (Assignments / Project)	Other
1	Transformer construction, fundamental laws, equivalent circuits, Transformer efficiency, transformer testing	7	2	0	2	3	-
2	Transformer construction, fundamental laws, equivalent circuits, Transformer efficiency, transformer testing	7	2	0	2	3	-
3	Transformer connections and harmonics, Auto transformers and tap changers.	7	2	0	2	3	-
4	Transformer connections and harmonics, Auto transformers and tap changers.	7	2	0	2	3	-
5	Parallel operation of transformers, transformer cooling, Difference between Single phase and three phase transformers	9	2	0	2	3	Quiz 1 (2 Hr)
6	Principle of energy conversion: Electromechanical energy conversion, magnetically single excited systems, magnetically multi-excited systems, Torque and stored energy in magnetic fields, multi-fed rotating systems.	7	2	0	2	3	-
7	Mid Term Exam						
8	Principle of energy conversion: Electromechanical energy conversion, magnetically single excited systems, magnetically multi-excited systems,	7	2	0	2	3	-



	Torque and stored energy in magnetic fields, multi-fed rotating systems.						
9	DC Machines: the generation of EMF torque, construction of DC machine, The magnetic circuit of the dc machine	7	2	0	2	3	-
10	DC Machines: the generation of EMF torque, construction of DC machine, The magnetic circuit of the dc machine	9	2	0	2	3	Quiz 2 (2 Hr)
11	Armature windings, armature reaction, methods of excitation	7	2	0	2	3	-
12	Armature windings, armature reaction, methods of excitation	7	2	0	2	3	-
13	Load characteristics of dc generators and motors, efficiency, testing of dc machines., Load characteristics of dc generators and motors, efficiency, testing of dc machines	7	2	0	2	3	
14	Load characteristics of dc generators and motors, efficiency, testing of dc machines., Load characteristics of dc generators and motors, efficiency, testing of dc machines	7	2	0	2	3	-
15	Revision	7	2	0	2	3	-
16	Final Term Exam						

5. Methods of students' assessment

No.	Assessment Methods *	Assessment Timing (Week Number)	Marks/ Scores	Percentage of total course Marks
1	Mid-term written Exam	7	20	20%
2	Final Written Exam	16	40	40%
3	Assignments and attendance	1-15	20	20%
4	Quizzes	5 & 10	10	10%
5	Final Practical Exam	15	10	10%



6. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course	Fitzgerald A. E., Kingsley C., Umans S. D. Electric Machinery McGraw-Hill Publishers, 7th edition, 2014.
	Other References	1) Sen P. C. Principles of Electric Machines and Power Electronics 3rd editions J. Wiley Publishers, 2014. 2) Chapman S. J. Electric Machinery Fundamentals McGraw-Hill Publishers, 5th edition, 2011.
	Electronic Sources	www.ekb.eg
	Learning Platforms	https://lms.nub.edu.eg/login/index.php
Supportive facilities & equipment for teaching and learning	Devices/Instruments	Data Show
	Supplies	White Board
	Electronic Programs	MATLAB Software Program
	Skill Labs/ Simulators	–
	Virtual Labs	–
	Other (to be mentioned)	Lecture Hall and Laboratory Usage

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Course Coordinator

Dr. Mohamed Kourany Saad
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