



Electrical and Renewable Energy Engineering Program

Course Specification - (2025-2026)

Electrical Machines (2) – ERE317

Academic Year	2025/2026	Semester	Fall
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1. Basic Information

Course Title (according to the bylaw)	Electrical Machines (2)				
Course Code (according to the bylaw)	ERE317				
Prerequisite:	Electrical Machines (1) – ERE221				
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	Contact Hours			
	Hours	Lecture	Tutorial	Practical	Total
	3	2	0	2	4
Course Type	Compulsory - Minor Requirements of Electrical and Renewable Energy Engineering				
Academic level at which the course is taught	Fourth Level				
Academic Program	Bachelor of Engineering of Electrical and Renewable Energy				
Faculty/Institute	Faculty of Engineering				
University/Academy	Nahda University				
Name of Course Coordinator	Assoc. Prof. Dr. Mohamed Mokhtar				
Course Specification Approval:	Department council		Faculty council		
Date of Approval of the course Specification:	13 / 9 / 2025		16 / 9 / 2025		



2. Course Overview

Fundamental of rotating AC machines: Construction of rotating machines, rotating fields of single and three phase machines, electromotive force and torque equation of the AC machines. Synchronous machines: construction, fundamental laws, cylindrical rotor machines, basic tests, salient pole machines, synchronous motors, power formulae, stability and damper bars, synchronization of machines, transient performance. Permanent Magnet Synchronous Generators (PMSG) and Switched Reluctance Machine (SRM). Induction machines: construction of different types of induction machine, concept of rotating and pulsating fields, principles of operation of three phase induction motor based on linear magnetic circuit, torque, slip characteristics, conditions and methods of starting of three phase induction motor (double cage and deep bar rotors), speed control of three phase induction motor, induction generator, testing of three phase induction motor.

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 the types and construction of synchronous and induction machines
		CLO2	Explain and discuss different the theory of operation of AC machines
		CLO4	Carry out lab experiments to analyze the performance of AC machines
A10	Acquire and apply new knowledge; and practice self, lifelong and other learning strategies	CLO4	Carry out lab experiments to analyze the performance of AC machines
		CLO5	Relate practical electrical machines with networks exist in power systems.
B4	Estimate and measure the performance of an electrical/electronic/digital system and circuit under specific input	CLO1	Recognize the types and construction of synchronous and induction machines
		CLO2	Explain and discuss different the theory of operation of AC machines



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
	excitation, and evaluate its suitability for a specific application	CLO3	Carry out the calculations to obtain the parameters of AC machines
		CLO4	Carry out lab experiments to analyze the performance of AC machines
		CLO5	Relate practical electrical machines with networks exist in power systems.
D2	Identify, analyze and evaluate the energy's conversion processes and management techniques	CLO1	Recognize the types and construction of synchronous and induction machines
		CLO2	Explain and discuss different the theory of operation of AC machines
		CLO3	Carry out the calculations to obtain the parameters of AC machines
		CLO4	Carry out lab experiments to analyze the performance of AC machines
		CLO5	Relate practical electrical machines with networks exist in power systems.

4. Teaching and Learning Methods

1. Interactive Lectures
2. Self-learning
3. Discussion
4. Case study
5. Report and Research

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	Fundamental of rotating AC machines	6	2	0	2	2	-
2	Construction of rotating machines, rotating fields of single and three phase machines, electromotive force and torque equation of the AC machines	6	2	0	2	2	-



3	Synchronous machines: construction, fundamental laws, cylindrical rotor machines, basic tests, salient pole machines,	6	2	0	2	2	-
4	synchronization of machines	6	2	0	2	2	-
5	transient performance	8	2	0	2	2	Quiz 1 (2 Hr)
6	synchronous motors	6	2	0	2	2	-
7	Midterm Exam						
8	Permanent Magnet Synchronous Generators (PMSG)	6	2	0	2	2	
9	Switched Reluctance Machine (SRM)	6	2	0	2	2	-
10	Induction machines: construction of different types of induction machine	8	2	0	2	2	Quiz 2 (2 Hr)
11	principles of operation of three phase induction motor	6	2	0	2	2	-
12	torque, slip characteristics	6	2	0	2	2	-
13	conditions and methods of starting of three phase induction motor (double cage and deep bar rotors	6	2	0	2	2	
14	speed control of three phase induction motors	6	2	0	2	2	-
15	testing of three phase induction motor	6	2	0	2	2	-
16	Final 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	4, 11	10	10%
4	Quizzes	5, 10	10	10%
5	Lab Activities	Weekly	10	10%
6	Final Practical Exam	15	10	10 %



1. Learning Resources and Supportive Facilities

Learning resources (books, scientific references, etc.) *	The main (essential) reference for the course	P. C. Krause, O. Wasynczuk, S. D. Sudhoff and S. Pekarek, Introduction to Modern Analysis of Electric Machines and Drives, Wiley-IEEE Press, 2022.
	Other References	1) E. Fitzgerald, C. Kingsley and S. Umans, Electric Machinery, McGraw - Hill, 7th. Ed., 2014. 2) Say, M.G., Alternating Current Machines- Fifth edition, Pitman, 1990. 3) Chapman, S. J., Electric Machinery fundamentals, McGraw Hill Co., 1991. 4) Sen, P.C., Introduction to Electrical Machines and Power Electronics - First edition, Pitman, 1990.
	Electronic Sources	www.ekb.eg
	Learning Platforms	https://lms.nub.edu.eg/login/index.php
Supportive facilities & equipment for teaching and learning	Devices/Instruments	Lecture hall equipped with Data-Show/Laser Pointer/PC/Laptop/Smart Interactive Screen/White Board.
	Supplies	Printer / Copier/ Library
	Electronic Programs	Management Information System (MIS)
	Skill Labs/ Simulators	Software Packages
	Virtual Labs	Internet Access
	Other (to be mentioned)	

Assoc. Prof. Dr. Mohamed Mokhtar
Course Coordinator

Dr. Mohamed Kourany Saad
Program Coordinator