The University of Jordan
School of Engineering
Electrical Engineering Department
2nd Semester – A.Y. 2020/2021

Course: **Electrical Machines – 0973373 (3 Cr. – Required Course)**

Instructor: Dr. Eyad A. Feilat
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Office Hours: Will be posted soon

Course website: http://elearning.ju.edu.jo/

Catalog description: Magnetic circuits. Single-phase and three-phase transformers: principles, analysis, performance characteristics and testing. Electromechanical energy conversion. Principles and classification of DC generators. DC motors: analysis, performance characteristics, starting, testing and speed control. Synchronous motors: analysis, performance characteristics, applications, starting and testing. Three-phase induction motors: analysis, performance characteristics, applications, starting and speed control. Single-phase induction motors. Special types of motors: stepper motor, universal motor, reluctance motor, and brushless DC motor.

Prerequisites by course: **EE** **0903203** Electrical Engineering (pre-requisite)

Prerequisites by topic: Students are assumed to have a background in the following topics:
• Basic electrical circuit analysis techniques.
• Physics of electromagnetic fields.

Textbook: **Principles of Electric Machines and Power Electronics by P. C. Sen , Wiley, 3rd Edition, 2013.**

References:

1. Electric Machinery Fundamentals by Stephen J. Chapman, McGraw-Hill Education, 5th edition, 2011.
2. Fitzgerald & Kingsley's Electric Machinery by Stephen D. Umans, McGraw-Hill Education, 7th edition, 2013.
3. Electrical Machines, Drives and Power Systems by Theodore Wildi, Pearson, 6th edition, 2005.
4. Electrical Transformers and Rotating Machines by Stephen L. Herman, Cengage Learning, 4th edition, 2016.
5. Electric Machines and Drives by Ned Mohan, Wiley, 1st edition, 2012.
6. Analysis of Electric Machinery and Drive Systems by Paul Krause, Oleg Wasynczuk, Scott D. Sudhoff, and Steven Pekarek, Wiley-IEEE Press, 3rd edition, 2013.

7. Schaum's Outline of Electric Machines & Electromechanics by Syed A. Nasar, McGraw-Hill Education, 2nd edition, 1997.

Schedule: 16 Weeks, 42 lectures (50 minutes each) plus exams.

Course goals: The overall objective is to provide the student with the basic concepts of electromechanical conversion and their devices, including DC generators and motors, three-phase synchronous and asynchronous motors, single-phase induction motors, and single-phase and three-phase power transformers.

Course learning outcomes (CLO) and relation to ABET student outcomes (SO):

Upon successful completion of this course, a student will:		[SO]
1.	Understand the basic concepts of electromagnetics and electromechanical conversion.	[1]
2.	Be familiar with power transformers operation and performance characteristics.	[1]
3.	Be familiar with the connections and groups of three-phase transformers.	[1]
4.	Be able to safely connect two or more transformers to operate in parallel.	[1]
5.	Know the basic relationships and characteristics of DC generators and motors.	[1]
6.	Be familiar with the techniques used for starting and speed control of DC motors.	[1]
7.	Know the basic relationships and characteristics of AC synchronous and asynchronous motors.	[1]
8.	Be familiar with the techniques used for starting and speed control of AC motors.	[1]

Course topics:		Hrs
1.	Electro-Magnetic Circuits: Review of basic laws and relationships of electro-magnetic structures: Amper's Law, B/H characteristics, inductance, etc.	4
2.	Single-Phase and Three-Phase Power Transformers: Ideal transformers. Equivalent circuit. Performance characteristics.	7
3.	DC generators: principles and classification. DC motors: analysis, performance characteristics, testing, applications, starting and speed control.	4
4.	Three-phase synchronous motors: analysis, performance characteristics, testing, applications and starting.	9
5.	Three-phase asynchronous (induction) motors: analysis, performance characteristics, testing, applications, starting and speed control.	7
6.	Single-phase induction motors.	6
7.	Special types of motors: stepper motors, universal motors, reluctance motors, and brushless DC motors.	5

Ground rules: Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. Eating and drinking are not allowed during class, and cell phones must be set to silent mode. All exams (including the final exam) should be considered cumulative. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

Assessment & grading policy:

Assignments	0%	Quizzes	0%
First Exam	30%	Projects	0%
Midterm Exam	30%	Lab Reports	0%
Final Exam	40%	Presentation	0%
		Total	**100%**

Last Revised: March 2021