Philadelphia University

Faculty of Engineering – Department of Electrical Engineering

Course Details:

Title:	Electrical Machines(1) (610314)
Prerequisite:	Electromagnetic (1) (610213)
Credit Hours:	3 credit hours (16 weeks per semester, approximately 45 contact hours)
Textbook:	"Electric Machinery Fundamentals", Fifth Edition, S. J. Chapman, 2012.
References:	"Fitzgerald & Kingsley's Electric Machinery", Seventh Edition, S. D. Umans, 2013. "An Introduction to Electrical Machine and transformers", Second Edition, G. McPherson and R. D. Laramore, 1990. "Electric machines - analysis and design applying MATLAB", J.J. Cathey, 2000. "Electric Machines - Theory, Operations, Applications, Adjustment, and Control", Second Edition, C.I. Hubert, 2002.
Course Description:	This course will introduce the students to fundamental concepts and principles of operation of various types of electrical machines. It will equip the students with basics and modeling skills for handling problems associated with electrical machines. It will give the students an appreciation of operational problems in the electrical power industry.

Course Outlines:

Week	Topic
1	Review of Ohm's law, Kirchhoff's laws, three-phase circuits, complex power
2	Review of magnetic induction, magnetic force, magnetic circuits
3, 4	The ideal transformer: construction, principle of operation. Hysteresis and eddy current losses. Practical transformer: equivalent circuit model, open circuit test, short circuit test
5	Performance of transformer: efficiency, voltage regulation
6, 7	Autotransformer, taps, parallel operation. Three-phase transformer and vector group. Cooling systems.
8	DC machines: construction, principle of operation, equivalent circuit model. Armature windings: lap and wave. Losses and power flow diagram.
9, 10	DC machines excitation methods. DC generator performance, DC motor performance, motor speed control, universal motor
11, 12	Induction machines: construction, principle of operation. Rotating magnetic field. Rotor slip. Equivalent circuit model. Wound-rotor and squirrel-cage.
13	Losses in induction machines, Power flow diagram. Efficiency. Starting methods. Single-phase induction motor
14	Synchronous machines: construction, principle of operation, phasor diagram, equivalent circuit model.
15	Synchronous machines performance: efficiency, voltage regulation. V-curves, synchronizing, motor starting methods
16	Revision

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

1.	Understand electromagnetic and electromechanical energy conversion in electrical machines	[a]
2.	Have knowledge of electrical machines construction and operation	[a]
3.	Know the parameters of electrical machines and understand the concept of equivalent circuit	[a , b, e]
4.	Know performance and characteristics of electrical machines under different loading conditions	[a , e]
5.	Have an idea about applications, starting methods, and speed control of DC and AC motors	[a , e]
6.	Know the conditions and advantages of connecting electrical machines in parallel	[a , e]

Assessment Guidance:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

Sub-Exams: The students will be subjected to two scheduled written exams, first exam and second exam during the semester. Each exam will cover materials given in lectures in the previous 3-4 weeks.

Quizzes: (3-5) quizzes of (10-15) minutes will be conducted during the semester. The materials of the quizzes are set by the lecturer.

Homework Homework should be solved individually and submitted before or on a set agreed date.

Cheating by copying homework from others is strictly forbidden and punishable by awarding the work with zero mark.

Final Exam: The students will undergo a scheduled final exam at the end of the semester covering the whole materials taught in the course.

Grading policy:

First Exam	20%
Second Exam	20%
Quizzes/Homework	20%
Final Exam	40%
Total:	100%

Attendance Regulation:

The semester has in total 45 credit hours. Total absence hours from classes and tutorials must not exceed 15% of the total credit hours. Exceeding this limit without a medical or emergency excuse approved by the deanship will prohibit the student from sitting the final exam and a zero mark will be recorded for the course. If the excuse is approved by the deanship the student will be considered withdrawn from the course.

May, 2018