



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)
Textbooks:	<p>“An Introduction to Electrical Machine and transformers”, Second Edition, G. McPherson and R. D. Laramore, 1990.</p> <p>“Electric machines - analysis and design applying MATLAB”, J.J. Cathey, 2000.</p> <p>“Electric Machinery and Power System Fundamentals”, First Edition, S. Chapman, 2001.</p> <p>“Performance and Control of Electrical Machines”, First Edition, D. O'Kelly, 1990.</p> <p>“Large Power Transformers (Studies in Electrical and Electronic Engineering)”, K. Karsai, D. Kerény, and L. Kiss, 1987.</p>
References:	<p>“Electric Machinery”, Sixth Edition, A.E. Fitzgerald, C. Kingsley Jr, S. Umans, 2002.</p> <p>“Electric Machines - Theory, Operations, Applications, Adjustment, and Control”, Second Edition, C.I. Hubert, 2002.</p> <p>“Electric Machines: Principles, Applications, and Control Schematics”, Second Edition, D. Zorbas, 2014.</p>
Course Description:	<p>This course will introduce the students for fundamental concepts and principles of operation of various types of electrical machines. It will equip the students with basic experimental and modeling skills for handling problems associated with electrical machines. It will give the students an appreciation of design and operational problems in the electrical power industry.</p>

Course Outlines:

Week	Topic
1	Review of principles of operation, construction, review of equivalent circuit, elements of a transformer, cooling systems
2	The ideal Transformer, practical transformers, open circuit test, short circuit test, efficiency, regulation
3	Practical transformer, three-phase connections
4	Measurement in three-phase, auto-transformer, taps, instrument transformer, parallel operation
5	DC machine, construction, basic equations and steady-state characteristics
6	DC machine circuit model, armature windings
7	Generator performance, motor performance, motor control
8	Basic theory and construction of squirrel-cage and wound-rotor of the induction motors
9	Equivalent circuit, losses, power flow, efficiency
10, 11	Analysis of machine equations, speed/torque curves, starting methods
12	Synchronous machines, construction, generated emf, armature reaction, phasor equation diagram, synchronous reactance
13, 14	Equivalent circuit, open and short-circuit characteristics, regulation, load

	angle, synchronous machine on infinite busbars
15	V-curves, synchronous condenser, synchronizing, starting
16	Single phase machines, reluctance shaded-pole, universal, permanent magnet, applications

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

1.	Have knowledge of electric machines construction and operation	[a]
2.	Be able to calculate parameters of equivalent circuit	[a , b]
3.	Know performance of electrical machines	[a , k]
4.	Have an idea about starting and speed control of motors	[e , k]

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.

January, 2018