



Philadelphia University
Faculty of Engineering
Department of Electrical
Second Semester, 2008/2009

Course Syllabus

Course Title: Electrical Machine (1)	Course code: 610381+640325
Course Level: 3	Course prerequisite: Electromagnetic(I) (610241,650241)
Lecture Time: 8:15-9:45 Mon, Wend	Credit hours: 3/week

Academic Staff Specifics

Name	Rank	Office Number and Location	Office Hours	E-mail Address
Dr Sabah Sheet	Assist.Prof	Room 810	9-10 S, T & T 10-11 M & W	sabsheet@yahoo.ca

Course description:

- To introduce the students for fundamental concepts and principles of operation of various types of electrical machines.
- To equip the students with basic experimental and modeling skills for handling problems associated with electrical machines.
- To give the students an appreciation of design and operational problems in the electrical power industry.

Course objectives:

Knowledge of electrical machines construction, operation
Calculation of parameters equivalent circuit.
Know performance of electrical machines
Have an idea about starting and speed control of motors

Course components

Electrical Machines and Transformers, principles and applications

By P. F. Ryff, D. Platnick & J. A. Karnas, Prentice-Hall 1987

- **Support material (s) (vcs, acs, etc).**
- **Study guide (s) (if applicable)**
- **Assignments and laboratory guide (s) if (applicable).**

Teaching methods:

- Lectures (3 per week) are used to describe and develop the concepts listed above.
- Supervisions are used to solve problems set by various exercises.
- Eight laboratories in the 3-d year laboratory programmer develop themes described in this module. The eight experiments illustrate practical aspects of operation of transformers, dc, induction and synchronous machines, respectively. Measurement techniques are emphasized as well as comparison with theoretical predictions.

Learning outcomes:

Upon completing this course, students should be able to:

- Knowledge and understanding:
 - Understand Theory of electromechanical energy conversion
 - Understand concepts of fundamental torque equation and rotating and oscillating fields
 - Know the principles of operation of electrical generators and motors
 - Know fundamental characteristics of various types of machines
 - Know the concept of the equivalent circuit
 - Understand the construction and design issues associated with electrical machines
 - Do simple testing of electromechanical devices
 - Appreciate the complexity of design of electromechanical devices
 - Identify different types of electrical machines
 - Derive equations describing operation of machines
 - Formulate relevant equivalent circuits
 - Compare and contrast the operation of different types of machines
 - Analyze simple problems related to operation of electrical machines

- Cognitive skills (thinking and analysis).
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- Practical skills (Transferable Skills).

- Solve problems of analysis of performance
- Explain the shape of characteristics of actual machines
- Apply equivalent circuits to performance prediction
- Interpret results and correlate them with theoretical predictions
- Perform simple tests on machines
- Work in as all team to conduct an experiment
- Write a technical report

Assessment instruments

- Short reports and/ or presentations, and/ or Short research projects
- Quizzes.
- Assignments.
- Final examination: 50 marks

<u>Allocation of Marks</u>	
Assessment Instruments	Mark
First Exam	20%
Second Exam	20%
Reports, research projects, Quizzes, assignments, Projects	10%
Final Exam	50%
Total	100%

Documentation and academic honesty

- Documentation style (with illustrative examples)

- Protection by copyright
- Avoiding plagiarism.

Course academic calendar

week	Basic and support material to be covered	assignments/reports and their due dates
(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.	assignment No.1
(4)	Measurement in three-phase, auto-transformer, taps, instrument transformer, parallel operation.	
(5)	Basic theory and construction of squirrel-cage and wound-rotor motors	
(6) First Examination	Equivalent circuit, losses, power flow, efficiency.	assignment No.2
(7)	Analysis of machine equations; speed/torque curves, starting	

	performance, starting methods	
(8)	Analysis of machine equations;	
(9)	speed/torque curves, starting performance, starting methods Synchronous machines, construction, generated <i>emf</i> ; output; armature reaction,; phasor equation diagram; synchronous reactance	
(10)	Equivalent circuit, open and short-circuit characteristics; regulation; load angle; synchronous machine on infinite busbars.	assignment No.3
(11)	Equivalent circuit, open and short-circuit characteristics; regulation; load angle; synchronous machine on infinite busbars.	
(12)	V-curves, synchronous condenser, synchronizing, starting.	
(13) Second Examination	DC machine, review of construction; basic equations and steady- state characteristics,	assignment No.4
(14)	DC machine circuit model, armature windings,.	
(15)	Generator performance, motor performance, motor control	
(16) Final Examination	Single phase machines, reluctance shaded-pole, universal, permanent magnet, applications.	

Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Course references

Books

1. Notes" Electric machines analysis and design applying MATLAB", By: J.Cathy, McGAW-HILL,2001
2. " An Introduction to Electrical Machine and transformers", By George Mcpherson and Robert D. Laramore, Wiley book.
3. " Electric Machine ,Theory ,Operation ,Application ,Adjustment,

Journals

IEEE Transactions on Power Apparatus and Systems

Websites

www.wikipedia.org