Philadelphia University

Faculty of Engineering and Technology
Mechatronics Engineering Department

Course Details:

Title: Electrical Machines for Mechatronics (0640314), Third Year.

Prerequisite: Electric Circuts_2 (0610212)

Credit Hours: 3-credit hours (16 weeks per semester, approximately 45 contact hours).

Text Book: Electrical Machinery Fundamentals, S.J. Chapman, Mc-Graw-Hill, 2012.

References:
1. Electrical Machines and Transformers, principles and applications, P. F, Ryff, D. Platnick & J. A. Karnas, Prentice-Hall 1987.
2. Electrical Machinery, A. E Fitzgerald, C. Kingsley, sixth edition, Mc-Graw-Hill, 2003.

.

Description: This course introduces the fundamental concepts and principles of operation of various types of electrical machines (dc, ac and elec. transformer) and gives the necessary knowledge of design and operational problems of machines in the electrical power industry.

Course Outlines:

Week	Basic and support material to be covered	Assignments
(1)	Introduction, Magnetic fields, Induced e.m.f.	
(2)	Transformers, Single phase transformers, Equivalent circuits of the transformer.	
(3)	Ideal transformer, Open circuit and short circuit tests of transformer, Regulation.	
(4)	Three- phase transformers, Auto transformer, Three- winding transformer.	
(5)	DC motors and generators, Induced E.M.F, Commutator, Armature reaction..	Assignment No.1
(6)	Methods of exciting of DC machine, Separately exciting, Shunt connected, Series connected, Compound wound.	
(7)	DC motors, Motor field, Speed of motor, Torque of motor.	
(8)	DC generator, Generator characteristics, Load characteristics.	
(9)	Basic theory of a.c machines, Construction and principles of a.c machines.	
(10)	Induction motors, Construction features, Slip, Equivalent circuits.	Assignment No.2

(11)	Torque- speed characteristics, Speed control, Phasor diagram.	
(12)	Synchronous motors, Equivalent circuit, Motor speed- torque characteristics.	
(13)	Power factor correction with synchronous motor, Starting of synchronous motors.	
(14)	Synchronous generators, Equivalent circuit, Synchronous generator phasor diagram, Power and torque.	
(15)	Simulating of machine operation using MATLAB.	
(16)	Case study of an electrical machine.	

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

1.	Understand the concept of electromechanical energy conversion and understand the principle operations of transformers, generators and motors, by applying principles of engineering, science, and mathematics.	[1]
2.	Know the construction associated with electrical machines.	[1]
3.	Analyze engineering problems related to the operation of electrical machines with MATLAB.	[6]

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 at least one exam during the semester.

Quizzes: Will be conducted during the semester. The materials of the quizzes are set by the lecturer.

Homework and projects: Homework and MATLAB simulation should be solved individually and submitted before or on a set agreed with the date. The student may be assigned to present project(s).

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:

Quizzes, Projects or Homeworks	20%
Mid Exam	30%
Final Exam	50%

Total:	100%

Attendance policy:

The semester has in total 45 credit hours. Total absence hours from classes 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.

Student Outcomes
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. 3. an ability to communicate effectively with a range of audiences. 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.