



Philadelphia University

Faculty of Engineering - Department of Electrical Engineering

Course Details:

- Title:** Drive Systems (610518)
- Prerequisite:** Automatic Control (610414)
- Credit Hours:** 3 credit hours (16 weeks per semester, approximately 45 contact hours)
- Textbook:** Fundamental of Electrical Drives , G.K. Dubey , Narrow 3a House, 2002
- References:**
1. J W. Shepherd, L. N. Hulley & D. T. W. Liang, "Power Electronics & Motor Control", Cambridge University Press.2001.
 2. Bimal K. Bose “ Power Electronics and Motor Drives “Elsevier Inc. 2006.

Course Description: The course is a requirement for the electrical engineering students. It introduces the principles, operation, and design of electrical drive systems. Students will learn the basic of DC and AC drives systems, the investigation methods of the whole system and performances evaluation. As well as electrical drives with special electrical machines, and the principles of drive system synthesis

Course Outlines:

Week	Topic
1	Introduction: Electrical drive systems and components , classifications , advantages, and applications .
2, 3	Dynamics of electrical drives, four quadrant representations, equivalent dynamics of loading of motors with different types of load, thermal model of motor for heating and cooling and mechanical transmission systems .
4, 5, 6	DC motor drives, starting, braking, speed control, controlled rectifier fed dc drives, DC chopper drives. Closed loop variable DC drives.
7, 8, 9, 10	AC motor drives : Induction motor drives, starting braking, speed control using voltage source inverters (VSI), current source inverters (CSI) , and cycloconverters , induction motor drives using slip energy recovery schemes.
11, 12, 13	AC motor drives : Synchronous motor drives, operation from fixed frequency supply, operation from variable frequency source , synchronous motor variable speed drives, starting large synchronous machines.
14, 15	Energy conservation in electrical drives, energy efficient operation, improvement of power factor, improvement of quality of supply .
16	Applications to traction systems , protection and Revision

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

1.	Ability of dealing with various industrial drive system types and their applications	[a, c, e, k]
2.	Be able to list the static power converters used in drive systems for certain application	[a, c, k]
3.	Operation of the DC and AC motor drives in the four - quadrant modes, and methods of motor braking and speed control voltage source inverter (VSI) and current source inverter(CSI)	[a , c , k]
4.	Operation and advantages of variable voltage variable frequency drives VVVF and its applications in AC motor drives	[a , c ,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.
- Tutorials, Homework and projects:** Lectures will be supplemented with tutorial classes. Eight to nine tutorial sheets are expected, each including 6-9 problems. Tutorial classes will be largely problem solving sessions based on converter circuits recently covered. Students will be expected to participate in problem solving efforts vigorously. Questions and clarifications, both by students and the tutor should be treated as desirable aspects of these sessions. Homework should be solved individually and submitted before or on a set agreed date. Student may be assigned to present project(s).
- Collective Participation:** Brain storming and collective discussions will be carried out during any lecture. Individual student will be assessed accordingly.
- 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%
Homework and projects	5 %
Quizzes and participation	15%
Final Exam	40%
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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.

June, 2018