

EE 522 – Electrical Drives (2)

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2

COURSE COORDINATOR

Dr Hady El Helw

TEXT BOOK:

Lecturer notes

COURSE DESCRIPTION:

Elements of electric drive systems. Matching between motor and loads characteristics. Concept of traveling time and drive dynamics. Drive control techniques. Drive applications. Introduction to matrix analysis of electric machines. D-Q modeling of electric machines. Speed control of DC motors based on D-Q model. Vector control of three-phase induction motor. Speed control of variable reluctance motor based on generalized torque matrix representation. Introduction to design of electric machines. Material selection and factors affecting the machine design. Design of single phase transformer. Design of three phase transformer. Design of DC machines.

PREREQUISITE:

EE 421, EE 422

RELATION OF COURSE TO PROGRAM:

Elective

COURSE INSTRUCTION OUTCOMES:

The student gains detailed skills related to the subject of electrical machine design, drive dynamics and applications.

TOPICS COVERED:

- DC and stationary field synchronous machines design
- Transformers Design
- Induction Motors Design
- D-Q model of DC machines
- Voltage control and speed control of DC machines based on D-Q model.
- Choice of electrical generators and motors suitable for load demand
- Type of friction and type of inertia and its effect on drive dynamic

- Temperature rise cooling in electrical machines
- Material selection suitable for electrical machines
- Load cycle and machine ratings according to it
- Traction load cycle and series DC motor as a match
- Drive control technique applied for traction

CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:

| Professional Component Content | | | |
|---------------------------------------|---------------------------|--------------------------|---------------------------|
| Math and Basic Sciences | Engineering Topics | General Education | Engineering Design |
| | ✓ | ✓ | ✓ |

RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:

| Student Outcomes | | Course Outcomes |
|-------------------------|--|------------------------|
| a. | An ability to apply knowledge of mathematics, science, and engineering. | |
| b. | An ability to design and conduct experiments, analyze and interpret data. | |
| c. | An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. | ✓ |
| d. | An ability to function on multi-disciplinary teams. | |
| e. | An ability to identify, formulate, and solve engineering problems. | |
| f. | An understanding of professional and ethical responsibility. | |
| g. | An ability to communicate effectively. | |
| h. | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal content | |
| i. | A recognition of the need for, and an ability to engage in life-long learning. | |
| j. | A knowledge of contemporary issues within and outside the electrical engineering profession. | |
| k. | An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice. | ✓ |