

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Department of Electrical Engineering
EE-306 Electromechanical Devices
Course syllabus 191

Dr. Ibrahim Omar Habiballah

OFFICE	PHONE	OFFICE HOURS	E-MAIL
59-2080	4985	MW 11:00-11:25am; T 11:00-11:25am & 12:00-12:50pm	ibrahimh@kfupm.edu.sa

Course Timing: MW 10:00 - 10:50 am (Room 59-1009; Sec. 6)
12:00 - 12:50 pm (Room 59-1009; Sec. 7) & 1:00-1:50pm (Room 59-1005; Sec. 8)

Textbook: Principles of Electric Machines and Power Electronics, By: P.C. Sen, 2013, 3rd edition

I. Three Phase AC Circuits: (Appendix B) (4 lectures)

- B.1 Review of Single-Phase Circuits
- B.2 Balanced Three-Phase Circuits
- B.3 Balanced Three-Phase Load
- B.4 Delta-Wye Transformation of Load
- B.5 Per-Phase Equivalent Circuit

II. Chapter one: Magnetic Circuits :(3 lectures)

- 1.1.1 i-H Relation
- 1.1.2 B-H Relation
- 1.1.3 Magnetic Equivalent Circuit
- 1.1.4 Magnetization Curve
- 1.1.5 Magnetic Circuit with Air-Gap
- 1.2 Hysteresis

III. Chapter two: Single Phase Transformers: (6 lectures)

- 2.1 Ideal Transformer
- 2.2 Practical Transformer
 - 2.2.1 Referred Equivalent Circuits (exact and approximate equivalent)
 - 2.2.2 Determination of Equivalent Circuit Parameters
- 2.2 Voltage Regulation
- 2.4 Efficiency
 - 2.4.1 Maximum Efficiency

IV. Chapter 4: DC Machines: (6 Lectures)

- 4.1 Electromagnetic Conversion
- 4.2 DC Machines
 - 4.2.1 Construction
 - 4.2.2 Evolution of DC Machines
 - 4.2.3 Armature Windings
 - 4.2.4 Armature Voltage
 - 4.2.5 Developed (or Electromagnetic) Torque
 - 4.2.6 Magnetization Curve of a DC Machine
 - 4.2.7 Classification of DC Machines
- 4.3 DC Generators
- 4.4 DC Motors
 - 4.4.1 Shunt Motor

4.4.2 Series Motor

V. Chapter 6: Synchronous Machines: (6 Lectures)

- 6.1 Construction of 3-Phase Synchronous Machines
- 6.2 Synchronous Generators
- 6.3 Synchronous Motors
- 6.4 Equivalent Circuit Model
 - 6.4.1 Determination of the Synchronous Reactance
 - 6.4.2 Phasor Diagram
- 6.5 Power and Torque Characteristics
- 6.7 Power Factor Control

VI Chapter 5: Three-Phase Induction Motors: (5 lectures)

- 5.1 Constructional Features
- 5.2 Rotating Magnetic Field
- 5.3 Induced Voltages
- 5.4.4 Running Operation
- 5.7 Equivalent Circuit Model
 - 5.7.1 Stator Winding
 - 5.7.2 Rotor Circuit
 - 5.7.3 Complete Equivalent Circuit
 - 5.7.5 Thevenin Equivalent Circuit
- 5.11.2 Effects of Rotor Resistance

Grading:

Home Works (4), Quizzes (9), and Attendance (2)	:	15
Lab	:	20
Major-Exam I Wk5, Wed. 2 nd Oct. (8:00-9:30 pm) Room 59-1001	:	15
Major-Exam II Wk11, Sun. 10 th Nov. (8:00-9:30 pm) Room 59-1001	:	15
Design Project	:	5
Final Exam Dec 25 th (7:00-10:00pm)	:	30

HW and Quizzes:

A homework assignment will be posted at the end of each chapter, followed by a quiz.

Project:

A design project will be assigned after the 2nd quarter of the semester.

Attendance:

- ❖ A student is allowed **a maximum of six absences before he deserves a DN grade**. The first two absences will be counted, but will not be penalized. Starting from the 3rd absence, you will be penalized by -0.5 points for each absence.
- ❖ You are **encouraged to read the blackboard announcements on a regular basis** to follow up the course progress, and to remind yourself with due dates of the different course assignments (e.g., homeworks, quizzes, exams, projects, ..etc).
- ❖ **You are KINDLY requested to close your mobile before entering the class; put it on the floor.**
- ❖ Your prompt availability at the beginning of the class is important. **Attendance after 3-minutes of the class starting will be marked LATE (1/2 absent). Attendance after 5-minutes of the class starting will be marked APSENT.**
- ❖ **Going out of the class after 3-minutes from the class starting in NOT PERMISSIBLE.**