

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Department of Electrical Engineering
EE-306 Electromechanical Devices
Course syllabus 162

Dr. Ibrahim Omar Habiballah

OFFICE	PHONE	OFFICE HOURS	E-MAIL
59-2080	4985	MW 12:20-12:40 pm; T 11:00-11:50am	ibrahimh@kfupm.edu.sa

Course Timing: Sec(3) MW 10:00 - 10:50 am ;
Sec(4) MW 11:00 - 11:50 am ;

Course Location: 59-1007
Course Location: 59-2003

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 : (4 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: (5 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 Running Operation
- 5.7 Equivalent Circuit Model
 - 5.7.1 Stator Winding
 - 5.7.2 Rotor Circuit
 - 5.7.3 Complete Equivalent Circuit

Grading:

Home Works (4), Quizzes (9), and Attendance (2)	:	15
Lab	:	20
Major-Exam I Wk5, Wed. 8 th March (6:00-7:30 pm)	:	15
Major-Exam II Wk11, Sun. 23 rd April (6:30-8:00 pm)	:	15
Design Project	:	5
Final Exam Sun. 28 th May 2017 (9:00-11:45 am)	:	30

HW and Quizzes:

A homework assignment will be posted for each chapter about seven days ahead of the submission due date. There will be a quiz related to each homework assignment.

Project:

A design project will be assigned after the 3rd quarter of the semester. The details of the project will be elaborated by the instructor.

Attendance:

- ❖ The absences in the very first week (2 absences) will be counted towards DN grade but will not be penalized. 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.**
- ❖ Your prompt availability at the beginning of the class is important. **Attendance after 3-minutes of the class starting will be marked LATE. Attendance after 5-minutes of the class starting will be marked ABSENT.**