

**KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS**  
**Department of Electrical Engineering**  
**EE-306 Electromechanical Devices**  
**Course syllabus 171**

**Dr. Ibrahim Omar Habiballah**

OFFICE	PHONE	OFFICE HOURS	E-MAIL
59-2080	4985	MW 11:00-11:50 am & 12:20-12:45pm	<a href="mailto:ibrahimh@kfupm.edu.sa">ibrahimh@kfupm.edu.sa</a>

**Course Timing:** MW 9:00 - 9:50 am (Room 59-1010)      &    10:00 - 10:50 am (Room 59-1009)

**Textbook:** Principles of Electric Machines and Power Electronics, By: P.C. Sen, 2013, 3<sup>rd</sup> edition

**I. Three Phase AC Circuits: (Appendix B) (3 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: (6 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

### Grading:

Home Works (4), Quizzes (9), and Attendance (2)	:	15
Lab	:	20
Major-Exam I Wk7, Wed. 1 <sup>st</sup> Nov. (6:30-8:00 pm)	:	15
Major-Exam II Wk13, Thur. 14 <sup>th</sup> Dec. (6:00-7:30 pm)	:	15
Design Project	:	5
Final Exam T.B.A	:	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 3<sup>rd</sup> quarter of the semester. The details of the project will be elaborated by the instructor.

### 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 3<sup>rd</sup> 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 APSENT.**
- ❖ **Going out of the class after 5-minutes of the class starting in NOT PERMISSIBLE.**