

**KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS**  
**Department of Electrical Engineering**  
**EE-306 Electromechanical Devices**  
**Course syllabus 182**

**Dr. Ibrahim Omar Habiballah**

OFFICE	PHONE	OFFICE HOURS	E-MAIL
59-2080	4985	MW 12:20-12:55pm; T 11:00-11:50am	<a href="mailto:ibrahimh@kfupm.edu.sa">ibrahimh@kfupm.edu.sa</a>

**Course Timing:** MW 10:00 - 10:50 am (Room 59-1007; Sec. 3)  
11:00 - 11:50 pm(Room 59-2003; Sec. 4)& 1:00-1:50pm (Room 59-2013; Sec. 5)

**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) (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 Running Operation
- 5.7 Equivalent Circuit Model
  - 5.7.1 Stator Winding
  - 5.7.2 Rotor Circuit
  - 5.7.3 Complete Equivalent Circuit

**Grading:**

<b>Home Works (4), Quizzes (9), and Attendance (2)</b>	<b>:</b>	<b>15</b>
<b>Lab</b>	<b>:</b>	<b>20</b>
<b>Major-Exam I</b> <b>Wk5, Wed. 6<sup>th</sup> Feb. (6:00-7:30pm)m – 57_006</b>	<b>:</b>	<b>15</b>
<b>Major-Exam II</b> <b>Wk11, Sun. 17<sup>th</sup> March (6:30-8:30pm) - 14-108</b>	<b>:</b>	<b>15</b>
<b>Design Project</b>	<b>:</b>	<b>5</b>
<b>Final Exam</b> <b>April 30<sup>th</sup> (8:00-11:00am)</b>	<b>:</b>	<b>30</b>

**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 2<sup>nd</sup> 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 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 from the class starting in NOT PERMISSIBLE.**