**Instructor:** Dr. M.A. Choudhry, 931 Engineering Sciences Building
Phone: 293-9685
Email: machoudhry@mail.wvu.edu

**Office Hours:** TR 10:00-11:00

**Class Time:** TR 12:30-1345
Class Location: 801 ESB

**Prerequisites:** EE 223, EE 224, PHYS 112


**Objective:** To acquaint the student with magnetic devices and principles of electromechanical energy conversion apparatus and power systems. By completion of the course, the student should be able to analyze and apply transformers, dc machines, induction motors, and synchronous machines and transmission lines in the steady-state. Students will utilize the latest software tool in a practical design.

**Expected Learning Outcomes:**
- Be able to solve three-phase balanced circuits.
- Be able to know voltage-current characteristics of different energy sources.
- Be able to analyze magnetic circuits.
- Be able to analyze circuits containing single-phase and three-phase transformers.
- Be able to use force and torque equations in electromechanical systems.
- Be able to calculate steady state values of current, voltage, torque, and power for dc machines.
- Be able to calculate steady state values of current, voltage, torque, and power for synchronous machine.
- Be able to calculate steady state values of current, voltage, torque, and power for induction motor.
- Be able to calculate line parameters of three-phase transmission line.
- Be able to draw impedance and reactance diagram on a common MVA base of power system.

**Tentative Lecture Schedule:**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Subject</th>
<th>Topic</th>
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<tr>
<td>1.</td>
<td>Introduction</td>
<td>Class Policy</td>
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AC Steady-State Analysis
Fundamentals of Electric Energy Systems

2. Electric Energy Sources
   Photovoltaic,
   Fuel Cells, Batteries, etc.

3. Magnetic Circuits
   B-H Relationship
   Magnetic Losses
   Analysis of Magnetic Circuits

4. Transformers
   Ideal
   Equivalent Circuit of Iron Core Trans.
   Analysis Examples Using Equiv. Circuit Phasor Diagram
   Polyphase Connections
   Auto Transformers

5. Electromechanics
   Energy Balance in Electromechanical System
   Force, Torque Equations & Applications

Test # 1

6. DC Machines
   Physical Description
   Armature Voltage
   Developed Torque
   Losses, Efficiency
   Name Plate
   Selected Example Problems

7. Synchronous Machines
   General Description, Revolving Field
   Performance of Round Rotor Generator
   Round Rotor Motor
   Parallel Operation
   Selected Example Problems

Test # 2

8. Induction Motors
   Phys. Description, Slip
   Equivalent Circuit, Approx. Equiv. Circuits
   Developed Torque
   Performance Calculations
   Nature of the Speed-Torque Curve

9. Electric Energy Systems
   Trans. Line Parameters
   Trans. Line Representation
   Trans. Line as a Two-port Network
   The One-Line Diagram
   Impedance and Reactance Diagram

Final Exam is on
**Grading Policy:**

Homework 10%
Software Simulation 10%
2 Tests 55%
Final Exam 25%

100%

Unless the performance or circumstances associated with a particular student indicate otherwise, the final grade in the course will be based on the exam average according to the following scale:

- A: 90 - 100
- B: 80 - 89
- C: 70 - 79
- D: 60 - 69
- E: 59 ↓

**Attendance Policy:**

Consistent with WVU guidelines, students absent from regularly scheduled examinations because of authorized University activities will have the opportunity to take them at an alternate time. Make-up exams for absences due to any other reason will be at the discretion of the instructor.

**Academic Integrity Statement:**

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code at http://www.arc.wvu.edu/admissions/integrity.html. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

**Social Justice Statement:**

WVU is committed to social justice. The instructor of this course concurs with WVU’s commitment and expects to maintain a positive learning environment based upon open communication and mutual respect and nondiscrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color, or national origin. Any suggestions as to how to further such a positive and open environment will be appreciated and given serious consideration.

If you are a person with disability and anticipate needing any type of accommodation in order to participate in this class, please advise us and make appropriate arrangements with Disability Services (293-6700).