

ELE 226

Electrical Power and Control Systems

Revised Fall 2016

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Dean's Review:

Dean's Signature: _____ Date Reviewed: ___/___/___

VIRGINIA WESTERN COMMUNITY COLLEGE
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ELE 226

Electrical Power and Control Systems

COURSE OUTLINE

Prerequisites: **ETR 114**

Course and Description:

ELE 226, Electrical Power and Control Systems (3 CR) Prerequisite: ETR 114. Studies the theory and operation of rotating machines, transformers, AC power distribution and control systems used in industrial applications. Lecture 2 hours. Laboratory 2 hours. Total 4 hours per week.

Course credits: 3 cr. **Lecture Hours:** 2 **Lab Hours:** 2

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Course Outcomes

At the completion of this course, the student should be able to:

1. Identify the parts of the following equipment and explain their purpose:
 - a) AC Power Systems
 - b) AC Motors
 - c) Transformers
 - d) Alternators
2. Explain:
 - a) Power generation concepts.
 - b) The speed/torque relationships for AC motors
 - c) How each basic motor and generator connection functions
 - d) The assorted power losses that occur in AC machines
 - e) Assorted types of AC motor control
 - f) The function of NEC and NEMA
 - g) The basic operating principles of single-phase and three-phase motors
 - h) The various single-phase and three-phase transformer connections
 - i) The three-phase motor equivalent circuit
 - j) The transformer equivalent circuit
3. Perform assorted calculations as assigned using the hand calculator
4. Work proficiently and observe all safety precautions in the electrical machines laboratory.

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Required Materials:

Textbook: Herman, Stephen L., Electrical Transformers and Rotating Machines 3rd Edition, Thompson Delmar Publishers, ISBN 978-1-1110-3913-4.

Equipment:

1. Scientific Calculator, TI-89 or equivalent.
2. Safety Glasses. These must be worn in the laboratory when operating machinery.

Supplemental Materials:

The following supplementary materials will be made available:

1. Various handouts and other references will be used—make sure you attend class and get these handouts.
2. Software: 1) MicroSim Pspice.

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Course Topics:

<u>Week</u>	<u>Topics/Activities</u>	<u>Reference</u>
1	Class Policies, Safety, etc. 1) Unit 1: Magnetism 2) Laboratory: View Safety Videos 3) Assignment: Read Units 1 and 2 and answer review questions Units 1 and 2.	Unit 1
2	1) Unit 2: Magnetic Induction 2) Laboratory: Problem Lab 3) Assignment: Read Unit 3 and answer review questions Unit 3.	Unit 2
3	1) Unit 3: Inductance in Alternating Current Circuits 2) Lab: Power Factor Correction Problem Lab 3) Assignment: Read Unit 4 and answer review questions Unit 4.	Unit 3
4	1) Unit 4: Single-Phase Isolation Transformers 2) Transformer Problems 3) Laboratory: Transformers 4) Assignment: Read Unit 5 and answer review questions Unit 5.	Unit 4
5	1) Unit 5: Autotransformers 2) Laboratory: Autotransformer Problems 3) Assignment: Read Unit 6 and answer review questions Unit 6.	Unit 5
6*	1) Unit 6: Current Transformers 2) Laboratory: Current Transformer Problems 3) Assignment: Read Unit 7 and answer review questions.	Unit 6
7	1) Test #1 (Units 1-6) 2) Unit 7: Three-Phase Circuits 3) Laboratory: Three-Phase Problems 4) Assignment: Read Unit 8 and answer review questions.	Unit 7
8	1) Unit 7: Three-Phase Circuits (continued) 2) Unit 8: Three-Phase Transformers 3) Laboratory: Direction of Rotation for Assorted Motors 4) Assignment: Read Unit 9 and answer review questions.	Units 7-8

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9	<ol style="list-style-type: none">1) Unit 8: Three-Phase Transformers (continued)2) Unit 9: Single-Phase Loads for Three-Phase Transformers3) Laboratory: Three-Phase Transformers4) Assignment: Read Units 10 answer review questions.	Units 8-9
10	<ol style="list-style-type: none">1) Unit 9 (Single-Phase Loads for Three-Phase Transformers)2) Unit 10: Transformer Installation3) Laboratory: Units 9 and 10 Problems4) Assignment: Read Units 11 and 12 and answer review questions.	Units 9, 10, 11, and 12
11	<ol style="list-style-type: none">1) Test #2 (Units 6 – 12)2) Alternators (Unit 16) and Three-Phase Motors (Unit 17)3) Lab: Demonstrate Paralleling Three-Phase Alternator4) Assignment: Read Units 16-17 and answer review questions.	Units 16-17
12	<ol style="list-style-type: none">1) Unit 17: Three-Phase Motors (continued)2) Lab: Three-Wire Motor Control3) Assignment: Read Unit 18 and answer review questions	Unit 17
13	<ol style="list-style-type: none">1) Unit 18: Single-Phase AC Motors2) Lab: Single-Phase Motors3) Assignment: Read Unit 19 and 20. Answer review questions.	Unit 18
14	<ol style="list-style-type: none">1) Test #3, Take Home Test, (Units 16 – 20)2) Unit 19: Motor Maintenance and Troubleshooting3) Unit 29: Motor Installation4) Lab: Testing Motor Windings	Unit 19-20
15	<ol style="list-style-type: none">1) Lab: Wire Sizing2) Review for Final Exam	Handouts
16	Final Exam	

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Notes to Instructors

1. Suggested Grading Scheme:

Scheduled Tests	55%
Labs and Homework	25%
Comprehensive Final Exam	20%

Grading Scale:

A	= 91 – 100
B	= 81 – 90
C	= 71 – 80
D	= 60 – 70
F	= below 60

2. Recommended lab materials, sample tests and supplemental handouts are available from the program head.
3. Instructors should notify the program head at least a day in advance for any special accommodations or materials that will be needed for class.

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