ELEC 154 Course Outline as of Fall 2013

CATALOG INFORMATION

Dept and Nbr: ELEC 154 Title: ROTATING MACHINERY
Full Title: Rotating Machinery
Last Reviewed: 9/23/2024

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.50	17.5	Lecture Scheduled	43.75
Minimum	3.00	Lab Scheduled	1.50	8	Lab Scheduled	26.25
		Contact DHR	0		Contact DHR	0
		Contact Total	4.00		Contact Total	70.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 87.50 Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade or P/NP
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
Fundamentals of three-phase and single-phase rotating machinery. Includes the operation and maintenance of Direct Current (DC) and Alternating Current (AC) motors, generators, and controllers. (Lecture/Lab)

Prerequisites/Corequisites:

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: Fundamentals of three-phase and single-phase rotating machinery. Includes the operation and maintenance of Direct Current (DC) and Alternating Current (AC) motors, generators, and controllers. (Lecture/Lab) (Grade or P/NP)
Prerequisites/Corequisites:
Recommended:
Limits on Enrollment:

Transfer Credit:
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**Transfer Area**	Effective:	Inactive:

CSU Transfer:	Effective:	Inactive:
UC Transfer:	Effective:	Inactive:

CID:

Certificate/Major Applicable:
Not Certificate/Major Applicable

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Operate and maintain AC and DC motors and controllers.
2. Operate and maintain AC and DC generators.
3. Install and maintain motor controllers.
4. Implement safety and tag-out procedures.

Objectives:
Upon completion of the course the student will be able to:

1. Analyze the operating principles of AC and DC motors.
2. Apply proper safety procedures for working around motors and rotating machinery.
3. Apply proper tag-out procedures when working on electrical equipment.
4. Diagnose and repair AC and DC motor starters and controllers.
5. Diagnose and repair AC and DC generator controllers.
6. Evaluate and repair defective rectifiers in alternators.
7. Interpret name plate information found on motors and generators.
8. Test for the correct installation of rotating machinery, including proper alignment and belt tensions.
9. Design predictive and ordinary maintenance routines using common rotating machinery test equipment.

Topics and Scope:

I. Safety in the Workplace
II. Magnetism & Electromagnetism
III. Single- and Three-Phase AC Generators (Alternators)
   A. slip rings and brushes
   B. rotating armature, stationary fields
   C. rotating fields, stationary armature

D. self-excitation
E. external excitation
F. rectifiers

IV. Basic Motor Operating Principles
A. attraction-repulsion
B. effect of generating current to line current
C. starting current
D. running current
E. effect of load on the motor

V. DC Motors
A. series motors
B. shunt motors
C. compound motors

VI. Series-Wound AC Motors
A. characteristics
B. compare to DC series motors

VII. AC Induction Motors
A. rotating magnetic fields
B. single-phase rotating fields
C. three-phase rotating fields
D. eddy currents
E. stators
F. rotors
G. squirrel cage rotors

VIII. Stepper Motors

IX. Servo Motors

X. Motor Controllers - AC and DC Tachometers

XI. Predictive Maintenance Procedures
A. vibration analysis
B. EMI evaluations and analysis of rotating machinery
C. megohmeters and their uses
D. belt slippage and adjustments
E. alignment and installation procedures of rotating machinery

XII. Rotating machinery name plate information and usage in maintenance and installation

XIII. Motor Safety and 440 V three Phase Circuits

XIV. Very large motor precautions (10 Hp and greater)

XV. Laboratory Exercises
A. lab safety procedures
B. using test equipment for analysis
C. magnetic and electromagnetic properties
D. DC motors
E. generators
F. AC motors
G. motor controllers
H. maintenance procedures

Assignment:

1. weekly reading assignments (10-20 pages)
2. lab assignments (5-10)
3. homework assignments (10-15) including writing a maintenance or safety procedure
4. quizzes (2-5)

5. midterm exam and final exam

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Maintenance or safety procedure	Writing 10 - 30%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems	Problem solving 20 - 50%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Lab Assignments	Skill Demonstrations 10 - 30%

Exams: All forms of formal testing, other than skill performance exams.

Multiple choice, True/false, Matching items, Completion	Exams 20 - 50%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:

Hughes, Austin. Electric Motors and Drives - Fundamentals, Types & Applications, 4th ed., Newnes, 2013.
Chapman, Stephen J. Electric Machinery Fundamentals. McGraw-Hill. 2011.