

CATALOG INFORMATION

Dept and Nbr: ELEC 53.15      Title: ADV ROTATING MACHINERY  
Full Title: Advanced Rotating Machinery for Maintenance Technicians  
Last Reviewed: 10/15/2007

| Units   |      | Course Hours per Week |      | Nbr of Weeks | Course Hours Total |       |
|---------|------|-----------------------|------|--------------|--------------------|-------|
| Maximum | 2.00 | Lecture Scheduled     | 2.00 | 17.5         | Lecture Scheduled  | 35.00 |
| Minimum | 2.00 | Lab Scheduled         | 0    | 8            | Lab Scheduled      | 0     |
|         |      | Contact DHR           | 0    |              | Contact DHR        | 0     |
|         |      | Contact Total         | 2.00 |              | Contact Total      | 35.00 |
|         |      | Non-contact DHR       | 0    |              | Non-contact DHR    | 0     |

Total Out of Class Hours: 70.00

Total Student Learning Hours: 105.00

Title 5 Category: AA Degree Applicable  
Grading: P/NP Only  
Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP  
Also Listed As:  
Formerly: ELEC299.44

**Catalog Description:**  
Advanced course in rotating machinery including maintenance procedures of both DC and AC motors and generators, repair and troubleshooting of controllers, and advanced maintenance procedures and installation of rotating machinery. This course is designed for maintenance technicians who use electric motors and generators.

**Prerequisites/Corequisites:**  
Course Completion of ELEC 53.14 ( or ELEC299.43) OR Concurrent Enrollment in ELEC 53.14 ( or ELEC299.43)

**Recommended Preparation:**

**Limits on Enrollment:**

**Schedule of Classes Information:**  
Description: Advanced course in rotating machinery including maintenance procedures of both DC and AC motors & generators, repair and troubleshooting of controllers, and advanced maintenance procedures and installation of rotating machinery. This course is designed for maintenance technicians who use electric motor generators. (P/NP Only)

Prerequisites/Corequisites: Course Completion of ELEC 53.14 ( or ELEC299.43) OR  
Concurrent Enrollment in ELEC 53.14 ( or ELEC299.43)

Recommended:

Limits on Enrollment:

Transfer Credit: CSU;

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

### **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

|                      |                      |            |             |            |             |
|----------------------|----------------------|------------|-------------|------------|-------------|
| <b>AS Degree:</b>    | <b>Area</b>          |            |             | Effective: | Inactive:   |
| <b>CSU GE:</b>       | <b>Transfer Area</b> |            |             | Effective: | Inactive:   |
| <b>IGETC:</b>        | <b>Transfer Area</b> |            |             | Effective: | Inactive:   |
| <b>CSU Transfer:</b> | Transferable         | Effective: | Spring 2004 | Inactive:  | Spring 2012 |
| <b>UC Transfer:</b>  |                      | Effective: |             | Inactive:  |             |

**CID:**

**Certificate/Major Applicable:**

Not Certificate/Major Applicable

### **COURSE CONTENT**

#### **Outcomes and Objectives:**

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

1. Contrast, diagnose and repair both AC and DC motor-starters and controllers.
2. Diagnose and repair both AC and DC generator controllers.
3. Analyze and interpret name plate information found on motors and generators.
4. Test for the correct installation of rotating machinery, including proper alignment and belt tensions.
5. Design predictive and ordinary maintenance routines using common rotating machinery test equipment.

#### **Topics and Scope:**

1. Short basic review of topics of Basic Rotating Machinery Course
2. Basic Motors - Operating Principles
  - a. Attraction-repulsion
  - b. Effect of generating current to line current
  - c. Starting current
  - d. Running current flow
  - e. Effect of load on the motor
3. DC Motors - Operations
  - a. Series Motors
  - b. Shunt Motor characteristics
  - c. Compound Motor characteristics
4. Stepper Motors

5. Brushless Motors
6. Operation of Basic AC Induction Motors
  - a. Rotating magnetic fields-generation of
  - b. Single phase rotating fields-generation of
  - c. Poly-phase rotating fields-generation of transformers and transformer action
  - d. Eddy currents
  - e. Stators
  - f. Rotors
  - g. Squirrel cage rotors
7. Servo Motors
8. Phase Reversal
9. Control of field rotation and how to change direction of rotation
10. Motor Controllers
  - DC and AC Tachometers
11. Predictive Maintenance Procedures
  - a. Vibration analysis
  - b. EMI evaluations and analysis of rotating machinery
  - c. Megohmmeters and their uses
  - d. Belt slippage and adjustments
  - e. Alignment and installation procedures of rotating machinery
12. Rotating machinery name plate information and usage in maintenance and installation
13. Motor Safety and 440 V three Phase Circuits
14. Very large motor precautions (10 Hp and greater)

### **Assignment:**

Application of concepts and problem solving in the following areas:

1. Evaluate motor condition and determine how to correctly service motor starters.
2. Troubleshoot and repair controllers.
3. Install, align and adjust belts used with AC and DC motors so that motor bearings do not wear prematurely.
4. Correctly use test equipment, such as voltmeters, ammeters, and ohmmeters to determine if the motor's coil is opened or shorted.
5. Maintain a concepts and problem solving journal and record evaluations and service/repair processes.
6. Three quizzes, midterm, 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.

|                                       |
|---------------------------------------|
| Concepts and problem solving journal. |
|---------------------------------------|

|                    |
|--------------------|
| Writing<br>5 - 10% |
|--------------------|

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

|                                                                                                                                          |                                  |
|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Homework problems                                                                                                                        | Problem solving<br>20 - 50%      |
| <b>Skill Demonstrations:</b> All skill-based and physical demonstrations used for assessment purposes including skill performance exams. |                                  |
| Class performances, Performance exams                                                                                                    | Skill Demonstrations<br>20 - 50% |
| <b>Exams:</b> All forms of formal testing, other than skill performance exams.                                                           |                                  |
| Multiple choice, True/false, Matching items, Completion                                                                                  | Exams<br>10 - 30%                |
| <b>Other:</b> Includes any assessment tools that do not logically fit into the above categories.                                         |                                  |
| None                                                                                                                                     | Other Category<br>0 - 0%         |

### **Representative Textbooks and Materials:**

Representative Texts:

Electric Motor Control, 8th Edition, Herman, Thompson/Delmar Learning Publishing, 2007

Understanding Motor Controls, Herman, Thompson/Delmar Learning publishing 2006