Washtenaw Community College Comprehensive Report

ELE 134 Motors and Controls
Effective Term: Winter 2018

Course Cover

Division: Advanced Technologies and Public Service Careers
Department: Industrial Technology
Discipline: Electricity/Electronics
Course Number: 134
Org Number: 14400
Full Course Title: Motors and Controls
Transcript Title: Motors and Controls
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Three Year Review / Assessment Report
Change Information:
Course description
Pre-requisite, co-requisite, or enrollment restrictions
Outcomes/Assessment
Objectives/Evaluation
Rationale: 3 yr review, update course with respect to technology changes and industry needs
Proposed Start Semester: Winter 2018
Course Description: This course is an introduction to the theory and application of AC and DC electrical machines and their controls. Topics include DC generators, DC motors and controls, three-phase power, three-phase transformers, alternators, three-phase and single phase AC motors and controls, electronic motor drives, synchronous motors, servo motors and stepper motors. In weekly lab assignments, students will read and interpret schematic diagrams, connect motors and controls, test and troubleshoot motors and controls.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 60 **Student:** 60
Lab: Instructor: 30 **Student:** 30
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90
Repeatable for Credit: NO
Grading Methods: Letter Grades
Audit
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

No Level Required

Requisites

Level II Prerequisite

ELE 111 minimum grade "C-"

Level II Prerequisite

Academic Math Level 3 or higher.

General Education

Request Course Transfer

Proposed For:

Student Learning Outcomes

1. Identify the principles of operation of DC and AC electrical machines including: motors, motor controls, generators, and transformers.

   Assessment 1

   Assessment Tool: A departmental final exam will be used to assess understanding of key concepts
   Assessment Date: Fall 2020
   Assessment Cycle: Every Three Years
   Course section(s)/other population: At least 3 sections
   Number students to be assessed: All students in at least 3 sections
   How the assessment will be scored: Departmentally-developed answer key
   Standard of success to be used for this assessment: Students will correctly answer 70% of the questions related to the outcome
   Who will score and analyze the data: Faculty who teach the class

   Assessment 2

   Assessment Tool: Departmental lab quizzes will be used to assess proficiency in applying the concepts and in performing hands-on tasks
   Assessment Date: Fall 2020
   Assessment Cycle: Every Three Years
   Course section(s)/other population: At least 3 sections
   Number students to be assessed: All students in at least 3 sections
   How the assessment will be scored: Departmentally-developed answer key
   Standard of success to be used for this assessment: Students will correctly answer 70% of the questions related to the outcome
   Who will score and analyze the data: Faculty who teach the class

2. Select and install motors, motor controls, generators and transformers utilizing nameplate information, code books and electrical diagrams.

   Assessment 1

   Assessment Tool: A departmental final exam will be used to assess understanding of key concepts
   Assessment Date: Fall 2020
   Assessment Cycle: Every Three Years

Course section(s)/other population: At least 3 sections
Number students to be assessed: All students in at least 3 sections
How the assessment will be scored: Departmentally-developed answer key
Standard of success to be used for this assessment: Students will correctly answer 70% of the questions related to the outcome
Who will score and analyze the data: Faculty who teach the class

Assessment 2

Assessment Tool: Departmental lab quizzes will be used to assess proficiency in applying the concepts and in performing hands-on tasks
Assessment Date: Fall 2020
Assessment Cycle: Every Three Years
Course section(s)/other population: At least 3 sections
Number students to be assessed: All students in at least 3 sections
How the assessment will be scored: Departmentally-developed answer key
Standard of success to be used for this assessment: Students will correctly answer 70% of the questions related to the outcome
Who will score and analyze the data: Faculty who teach the class

3. Test and troubleshoot motors, motor controls, generators and transformers utilizing electrical diagrams and test equipment.

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Course section(s)/other population: At least 3 sections
Number students to be assessed: All students in at least 3 sections
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Who will score and analyze the data: Faculty who teach the class

Assessment 2

Assessment Tool: Departmental lab quizzes will be used to assess proficiency in applying the concepts and in performing hands-on tasks
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Course section(s)/other population: At least 3 sections
Number students to be assessed: All students in at least 3 sections
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Course Objectives

1. Identify the construction, principles of operation, and operating characteristics of series, shunt and compound DC motors and generators.
2. Analyze the operation of common DC motor control circuits including: stop/start, forward/reverse, brake, speed change, and overload protection.
3. Identify the construction, principles of operation and operating characteristics of three phase

transformers.
4. Identify the construction, principles of operation, and operating characteristics of three phase alternators.
5. Determine power, voltage, and current for delta and wye connected three phase circuits.
6. Identify the construction, principles of operation, and operating characteristics of single and three phase AC motors including: squirrel cage induction, synchronous wound rotor, split phase, capacitor start, capacitor start/ capacitor run, PSC, shaded pole and universal.
7. Analyze the operation of common three phase motor control circuits including: stop/start, forward/reverse, brake, jog/run, speed change, and overload protection.
8. Identify the principles of operation of solid state motor controls for DC and AC motors.
9. Identify the construction, principles of operation, and operating characteristics of servo and stepper motors and controls.
10. Interpret and apply the information commonly found on a motor nameplate.
11. Connect DC motor and generator circuits.
12. Connect three phase alternators, transformers and loads in common configurations.
13. Determine the required conductor size and over current protection for installation of a three phase motor.
14. Connect single phase and three phase motor circuits.
15. Demonstrate the use of test equipment such as ohmmeters, meggers, digital multimeters, clamp-on ammeters, and phase sequence meters to test DC and AC machines.
16. Identify the common reasons for DC motor and generator failure, their causes, and solutions.
17. Demonstrate the use of a systematic procedure to troubleshoot DC generators, motors and controls, using ladder diagrams and test equipment.
18. Identify the common reasons for single and three phase motor failure, their causes, and solutions.
19. Demonstrate the use of a systematic procedure to troubleshoot single phase and three phase motors and controls using ladder diagrams and test equipment.
20. Wire, program and troubleshoot solid state motor drives such as VFDs and servo drives.

New Resources for Course

Course Textbooks/Resources

Textbooks

NJATC. *Motors*, Second ed. ATP, 2010

Manuals

Petty, D.. ELE 134 Coursepack, Petty, D., 08-01-2017

Periodicals

Software

Equipment/Facilities

Level III classroom

Computer workstations/lab

Reviewer	Action	Date
Faculty Preparer:		
Dale Petty	*Faculty Preparer*	*Jul 05, 2017*
Department Chair/Area Director:		
Thomas Penird	*Recommend Approval*	*Jul 06, 2017*

Dean:		
Brandon Tucker	*Recommend Approval*	*Jul 18, 2017*
Curriculum Committee Chair:		
Lisa Veasey	*Recommend Approval*	*Oct 17, 2017*
Assessment Committee Chair:		
Michelle Garey	*Recommend Approval*	*Oct 18, 2017*
Vice President for Instruction:		
Kimberly Hurns	*Approve*	*Oct 25, 2017*