**Apprenticeship 201**

Instructor: Kevin Cryer

Cell Phone: 503-409-5243

**Class Times**

Tuesday 6 – 8:50PM

Thursday 6 – 8:50PM

**Course Description**

This course introduces students to various aspects of electric motors including design, application, proper selection, effective overload and short circuit protection, starting techniques and troubleshooting methods. Students will also be utilizing the National Electrical Code as practical tool to make safe and efficient motor installation and repairs. Additional topics include conduit bending, encoders, servo and motion controllers, PID loops and basic electrical drawings. Students will also be exposed to multiple types of input and pilot devices commonly used in motor controls for commercial and industrial control systems.

**Required Textbook and Materials**

National Electric Code 2017 Edition

Scientific Calculator

**Grading Policy and Procedures**

Your grade will be based on a combination of exams, daily quizzes, and overall attendance.

**Midterm Exam and Final Exam**

There will be one midterm and one final exam given in this course. All questions and material referenced in the exams will be covered prior to the test.

**Absence and Attendance**

Your attendance is a requirement to complete your apprentice training. Class is not an optional event. There will be a sign in sheet at the beginning of every class that you will need to sign prior to starting or you will not get credit for that day. Any absence you incur will have a negative impact on your final grade. There will be no make-up work, no extra credit, and no special projects during this course. If you have any special circumstances, you will need to discuss your options with the instructor.

**Overall Grading Summary Total Points**

Midterm Exam 20% 90-100% A

Final Exam 20% 80-89% B

Quizzes 30% 70-79% C

Attendance 30% 60-69% D

Total 100%

**Electronics in Class**

The use of cellphones and laptop computers during class will not be allowed during lecture, discussion, or presentations. Limited use will be allowed during lab work for reference material only. Cell phones will not be used as a calculator during exams. During class hours your cell phone should be silenced and if you have a need to take a phone call during class hours you will inform the instructor and excuse yourself from the room.

**Course Content**

This is not an absolute schedule. If we need more/less time in one particular section adjustments will occur only after the instructor announces it to the students prior to the next class.

* Week 1
  + Tuesday - Class introduction. Expectations and resources available.
  + Thursday - Safe work practices, PPE, Arc Flash. NEC applications to motor circuits.
* Week 2
  + Tuesday - Electrical testing tools & equipment. Basic electrical principles.
  + Thursday - Motor types and control methods. Conduit bending introduction.
* Week 3
  + Tuesday - Motor nameplate data and how to use it.
  + Thursday - Single phase motors. Capacitor testing.
* Week 4
  + Tuesday - DC Motors. Building a simple DC motor.
  + Thursday - 3 Phase motors. Insulation tests and motor failures.
* Week 5
  + Tuesday - Specialty motor types: permanent magnet, wound rotor, synchronous.
  + Thursday - Midterm code test and practical application exam.
* Week 6
  + Tuesday - Motor speed, torque, gear/pulley ratios. Application calculations.
  + Thursday - Motor frame types, preventative maintenance, motor replacements.
* Week 7
  + Tuesday - Motor protection types. Safe installations.
  + Thursday - Soft starts, (Y) Delta starting and their applications. Motor wiring schematics.
* Week 8
  + Tuesday - Variable frequency drives and their applications.
  + Thursday - Motor feedback devices. SSI and incremental rotary encoders.
* Week 9
  + Tuesday - Analog control, PID loops, stepper motors, position and torque control.
  + Thursday - No Class. Thanksgiving.
* Week 10
  + Tuesday - Final code test and practical application exam.
  + Thursday - Final Review.
* Week 11
  + Tuesday - Last day of class. Lessons learned and term review.

**Educational Equity**

Students who may need accommodations due to documented disabilities, who have medical information which the instructor should know, or who need special arrangements in an emergency should speak with their instructor during the first week of class. If you believe you may need accommodations but are not yet registered with the Center for Accessibility Resources (CFAR), please visit the [CFAR Website](https://www.linnbenton.edu/cfar) for steps on how to apply for services or call [(541) 917-4789](tel:5419174789).