Course Title: Controllers and Control Loops
Semester Course Prefix and Number: ECM 2277
Submitted By: Scott Norcia
Approval Date: 9/6/16

Number of Credits: 2
Semester(s) Offered: Spr
Class Size: Negotiated by AASC on: (date)

Number of Lecture Credits: 1
Number of Lab Credits: 1
Number of Studio/Demonstration/Internship Credits: 2
Number of Lab Hours: 2

Catalog Description:
The course is a "Hybrid" or "Blended" course with the majority of the learning environment traditional in-class lectures and hand-on lab work which also includes Web-based learning activities to complement face-to-face work. This course covers the core of industrial process control, control loops and controllers. The course defines the components, configuration, installation, and I/O calibration of control loops. Analysis of control modes and algorithms for PID control are studied and practiced in a lecture/lab environment. Control mode design and system architecture completes the study.

Prerequisites and/or recommended entry skills/knowledge:
Course Prerequisite(s): ECM 1253, ECM 1233, ECM 1243, ECM 1295, & ECM 1244
Reading Prerequisite: None
Composition Prerequisite: None
Mathematics Prerequisite: None

Career Programs and Transfer Majors Accessing this Course:
Electrical Controls and Maintenance Diploma
Electrical Controls and Maintenance AAS

Minnesota Transfer Curriculum Goal(s) partially met by this course if applicable:
(Notes: No more than two goals may be met by any one course. AASC review and the Chief Academic Officer’s approval are required.)

0. None
1. Communications
2. Critical Thinking
3. Natural Sciences
4. Mathematical/Logical Reasoning
5. History and the Social and Behavioral Sciences
6. The Humanities and Fine Arts
7. Human Diversity
8. Global Perspectives
9. Ethical and Civic Responsibility
10. People and the Environment
**Learning Outcomes:** (including any relevant competencies listed in the Minnesota Transfer Curriculum)

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

1.) Explain the functions of proportional, integral and derivative control actions.
2.) Calculate the effects of both the proportional and integral control actions.
3.) Configure both a flow and temperature PID control loop in the Allen Bradley Control Logix PLC
4.) Trend PID controller I/O variables in the Allen Bradley Control Logix PLC
5.) Hand tune a flow PID controller using the Ziegler-Nichols closed loop tuning method
6.) Tune a flow PID controller using the Techmation Protuner software package.

**Student Assessment Methods:**

Lab assignments, worksheets, papers, and tests.

**Use of Instructional Technology:** (includes software, interactive video and other instructional technologies):

Power Point Software, videos, software based lab simulators.

**Additional Special Information:** (special fees, directives on hazardous materials, etc.)

Laptop Computer Lease and Required Tool List

**Transfer Information:** (Please list colleges/majors that accept this course in transfer.)

None

**Affiliated Mesabi Range College Courses and Programs:**

**Approvals:**

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**Distribution:** Original – Instructional Services

**Copies:** Transfer Specialist, Originating Faculty Member, Records

**Revised:** December 2012