

# MESABI RANGE COLLEGE

## Course Outline

**Course Title:**     **Controllers and Control Loops**  
**Semester Course Prefix and Number:**     **ECM 2277**  
**Old Quarter Course Prefix and Number:**

**Submitted By:**     **Scott Norcia**  
**Approval Date:**  
**Revision Date:**     **9/6/16**

**Number of Credits:**             **2**     **Number of Lecture Credits:**     **1**  
**Semester(s) Offered:**         **Spr**     **Number of Lab Credits:**     **1**     **Number of Lab Hours:**     **2**  
**Class Size:**                     **24**     **Number of Studio/Demonstration/Internship Credits:**  
       Negotiated by AASC on:  
       (date)

### Course Purpose Code:

- 0 – Developmental Courses
- 1 – Non-transferable
- 2 – Technical course related to career programs
- 3 – College course which has the primary goal of applying certain concepts (e.g. vocal ensemble)
- 4 – Other college course not considered a part of MNTC (e.g. computer science, health, physical education)
- 5 – Course which is intended to fulfill the Minnesota Transfer Curriculum (MNTC) requirements or intended for transfer.
- 9 – Continuing Education/Customized Training specialized credit course (not occurring in 0-5)

### 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. <input checked="" type="checkbox"/> None                                | 6. <input type="checkbox"/> The Humanities and Fine Arts     |
| 1. <input type="checkbox"/> Communications                                 | 7. <input type="checkbox"/> Human Diversity                  |
| 2. <input type="checkbox"/> Critical Thinking                              | 8. <input type="checkbox"/> Global Perspectives              |
| 3. <input type="checkbox"/> Natural Sciences                               | 9. <input type="checkbox"/> Ethical and Civic Responsibility |
| 4. <input type="checkbox"/> Mathematical/Logical Reasoning                 | 10. <input type="checkbox"/> People and the Environment      |
| 5. <input type="checkbox"/> History and the Social and Behavioral Sciences |  |

**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:**

Body	Representative Signatures	Date
Faculty Association		
Academic Affairs Standards Committee		
Chief Academic Officer		

**Distribution:** Original – Instructional Services  
**Copies:** Transfer Specialist, Originating Faculty Member, Records  
**Revised:** December 2012