

MINNESOTA WEST COMMUNITY & TECHNICAL COLLEGE

COURSE OUTLINE

Faculty is required to have the outline submitted to the Academic Affairs Office. The course outline is the form used for approval of new courses by the Academic Affairs and Standards Council.

DEPT. MECH COURSE NUMBER: 2141

NUMBER OF CREDITS: 2 credits

COURSE TITLE: Proportional & Servo Control Theory

CATALOG DESCRIPTION: Provides students with knowledge and working skills dealing with electronic control of electro-hydraulic proportional and servo controls.

AUDIENCE: Mechatronics

FULFILLS MN TRANSFER CURRICULUM AREA(S) (**Leave blank if not applicable**)

Area: by meeting the following competencies:
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PREREQUISITES OR NECESSARY ENTRY SKILLS/KNOWLEDGE:

Successful completion of year one in the Mechatronics diploma or A.A.S. degree program or equivalent work experience.

LENGTH OF COURSE : 1Semester

THIS COURSE IS USUALLY OFFERED:

Every other year fall spring summer undetermined

Four goals are emphasized in course at Minnesota West Community & Technical College:

- 1) **ACADEMIC CONTENT:** The academic objectives of this course are:
 - a. To achieve basic knowledge and skills needed to work with electro-hydraulic proportional and servo controls.
- 2) **THINKING SKILLS:** This course will help students improve the effectiveness of their thinking skills through:
 - a. Develop test taking skills
 - b. Analyze problems and propose solutions
- 3) **COMMUNICATIONS SKILLS:** This course will help students improve their oral and written communication skills through:

- a. Demonstrate both written and oral communication skills during presentations
 - b. Interact and collaborate other students in assignments
- 4) HUMAN DIVERSITY: This course will help students recognize, understand, and appreciate human diversity through:
- a. Help students recognize, understand and appreciate working in groups to solve problems

TOPICS TO BE COVERED:

1. Basic electronic principles
2. Electronic component function and purpose
3. Distance measuring transducer operation
4. Flow transducer operation
5. Torque transducer operation
6. Instrumentation terms
7. Regulated power supply function
8. Signal conditioning equipment operation
9. X-Y plotter
10. Oscilloscope operation
11. Position feedback devices
12. Level sensing feedback devices
13. Digital inputs
14. Proportional control hardwire diagrams
15. Power supply troubleshooting procedures
16. Control card troubleshooting procedures
17. Positional proportional valve system operation
18. Proportional system troubleshooting procedures
19. Proportional controlled pump operation
20. Proportional valve operational characteristics
21. Proportional solenoid operation
22. Proportional valve terms
23. Proportional system components
24. Amplifier adjustments
25. Ramp generator function
26. Servo system components
27. Servo system power unit requirements
28. Servo system troubleshooting procedures
29. Servo controlled pump operation
30. Velocity servo system operation
31. Positional servo system operation
32. Servo system feedback devices
33. Two-stage servo valve operation
34. Torque motor operation
35. Mechanical servo systems
36. Flapper nozzle servos
37. Servo system terms
38. Servo amplifier operation

- 39. Servo valve flushing procedure
- 40. Sound level meter operation

COURSE LEARNING OUTCOMES (GENERAL):

1. Identify proportional hydraulic function and components
2. Identify servo hydraulic function and components
3. Demonstrate knowledge and ability to work with electro-hydraulic proportional and servo controls.
4. Troubleshoot and diagnose electro-hydraulic systems

STUDENT LEARNING OUTCOMES (SPECIFIC):

1. Understand electronic theory and principles
2. Demonstrate electronic circuit testing
3. Exhibit knowledge of various feedback devices
4. Identify proportion system components
5. Install and operate a proportion hydraulic system
6. Identify servo system components
7. Implement a hydraulic servo system
8. Perform electro-hydraulic controls diagnosis
9. Compare open and closed loop systems
10. Troubleshoot electrical controls and hydraulic components used in electro-hydraulic circuits

LEARNING/TEACHING TECHNIQUES used in the course are:

- | | |
|--|--|
| <input checked="" type="checkbox"/> Collaborative Learning | <input checked="" type="checkbox"/> Problem Solving |
| <input type="checkbox"/> Student Presentations | <input checked="" type="checkbox"/> Interactive Lectures |
| <input checked="" type="checkbox"/> Creative Projects | <input type="checkbox"/> Individual Coaching |
| <input type="checkbox"/> Lecture | <input type="checkbox"/> Films/Videos/Slides |
| <input type="checkbox"/> Demonstrations | <input type="checkbox"/> Other (describe below) |
| <input type="checkbox"/> Lab | |

ASSIGNMENTS AND ASSESSMENTS FOR THIS CLASS INCLUDE:

- | | | |
|--|--|--|
| <input checked="" type="checkbox"/> Reading | <input checked="" type="checkbox"/> Tests | <input checked="" type="checkbox"/> Individual Projects |
| <input checked="" type="checkbox"/> Oral Presentations | <input checked="" type="checkbox"/> Worksheets | <input checked="" type="checkbox"/> Collaborative Projects |
| <input type="checkbox"/> Textbook Problems | <input type="checkbox"/> Papers | <input type="checkbox"/> Portfolio |
| <input type="checkbox"/> Group Problems | <input type="checkbox"/> Term Paper | |
| <input type="checkbox"/> Other (describe below) | | |

Veteran Services: Minnesota West is dedicated to assisting veterans and eligible family members in achieving their educational goals efficiently. Active duty and reserve/guard military members should advise their instructor of all regularly scheduled military appointments and duties that conflict with scheduled course requirements. Instructors will make every effort to work with the student to identify adjusted timelines. If you are a veteran, please contact the Minnesota West Veterans Service Office.

The information in this course outline is subject to revision

To receive reasonable accommodations for a documented disability, please contact the campus Student Services Advisor or campus Disability Coordinator as arrangements must be made in advance. In addition, students are encouraged to notify their instructor.

This document is available in alternative formats to individuals with disabilities by contacting the Student Services Advisor or by calling 800-658-2330 or via your preferred Telecommunications Relay Service.

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Revised 10/1/16