Faculty members are 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: 2100**

**NUMBER OF CREDITS: 3 Lecture: 2 Lab: 1**

<table>
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<th>Course Title:</th>
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<tr>
<td>Advanced Systems Calculations</td>
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<th>Catalog Description:</th>
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<td>Provides students with knowledge and skills of calculating and sizing systems in both mobile and industrial fluid power applications.</td>
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**FULFILLS MN TRANSFER CURRICULUM AREA(S)**

Goal 1: Communication: ____ by meeting the following competencies:

Goal 2: Critical Thinking: ____ by meeting the following competencies:

Goal 3: Natural Sciences: ____ by meeting the following competencies:

Goal 4: Mathematics/Logical Reasoning: ____ by meeting the following competencies:

Goal 5: History and the Social and Behavioral Sciences: ____ by meeting the following competencies:

Goal 6: The Humanities and Fine Arts: ____ by meeting the following competencies:

Goal 7: Human Diversity: ____ by meeting the following competencies:

Goal 8: Global Perspective: ____ by meeting the following competencies:

Goal 9: Ethical and Civic Responsibility: ____ by meeting the following competencies:

Goal 10: People and the Environment: ____ by meeting the following competencies:

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<th>Prerequisites or Necessary Entry Skills/Knowledge:</th>
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<tr>
<td>Successful completion year one of the Mechatronics diploma or A.A.S. degree program or equivalent work experience.</td>
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Topics to be Covered

2. Applications for motor/gear reducer combinations.
3. Hydraulic pump selection and displacement factors and efficiencies.
4. Pneumatic systems components calculations.
5. SCFM, CV, pressure, efficiency, velocity, and torque calculations.
6. Tractive effort/drawbar pull, vehicle torque, RPM, resistance calculations.
7. Accumulator sizing, selection, and applications.
8. Open, closed, center, tandem and horse power limiting systems.

Student Learning Outcomes

1. Demonstrate the ability to size and select hydraulic and pneumatic components to meet different system requirements.
2. Calculate hydraulic motor efficiencies, pressures, torque, displacement.
3. Examine gear reducer application requirements and ratios.
4. Identify hydraulic pump selection factors and efficiencies.
5. Calculate cylinder force/pressure.
6. Calculate resistances, vehicle tractive effort/drawbar, pull/torque, and wheel RPM.
7. Identify accumulator applications, sizing and selection factors.
8. Calculate SCFM, CV, pressure, efficiency, velocity, and torque for pneumatic system components.
9. Design and implement systems using various directional, pressure and flow control components.
10. Identify and control potential safety hazards and implement safe working practices.

Is this course part of a transfer pathway: Yes ☐ No ☒