Course Title: Advanced Systems Calculations

Catalog Description:
Advanced Systems Calculations provides students with knowledge and skills of calculating and sizing systems in both mobile and industrial fluid power applications.

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.

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

Topics to be Covered
Hydraulic motor displacement and selection factors.
Applications for motor/gear reducer combinations.
Hydraulic pump selection and displacement factors and efficiencies.
Pneumatic systems components calculations.
SCFM, CV, pressure, efficiency, velocity, and torque calculations.
Tractive effort/drawbar pull, vehicle torque, RPM, resistance calculations.
Accumulator sizing, selection, and applications.
Open, closed, center, tandem and horse power limiting systems.
Cylinder selection, force, and pressure calculations.
**Student Learning Outcomes**

<table>
<thead>
<tr>
<th>Demonstrate the ability to size and select hydraulic and pneumatic components to meet different system requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate hydraulic motor efficiencies, pressures, torque, displacement.</td>
</tr>
<tr>
<td>Examine gear reducer application requirements and ratios.</td>
</tr>
<tr>
<td>Identify hydraulic pump selection factors and efficiencies.</td>
</tr>
<tr>
<td>Calculate cylinder force/pressure.</td>
</tr>
<tr>
<td>Calculate resistances, vehicle tractive effort/drawbar, pull/torque, and wheel RPM.</td>
</tr>
<tr>
<td>Identify accumulator applications, sizing and selection factors.</td>
</tr>
<tr>
<td>Calculate SCFM, CV, pressure, efficiency, velocity, and torque for pneumatic system components.</td>
</tr>
<tr>
<td>Design and implement systems using various directional, pressure and flow control components.</td>
</tr>
<tr>
<td>Identify and control potential safety hazards and implement safe working practices.</td>
</tr>
</tbody>
</table>

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

*If yes, please list the competencies below*

Revised Date: 1/26/2022