

## Rubric for Performance Indicators of Student Outcome (e): An ability to identify, formulate, and solve engineering problems

<b>Performance Indicator</b>	<b>1: Beginning</b>	<b>2: Developing</b>	<b>3: Proficient</b>	<b>4: Exemplary</b>
Formulate the problem and identify key issues/variables	<ul style="list-style-type: none"> <li>• Missing problem formulation</li> <li>• Missing most key issues / variables</li> <li>• Missing most criteria</li> <li>• Missing most constraints</li> <li>• Missing most assumptions</li> </ul>	<ul style="list-style-type: none"> <li>• Weak problem formulation</li> <li>• Some issues / variables identified, but many missing</li> <li>• Many criteria missing</li> <li>• Many constraints missing</li> <li>• Many assumptions missing</li> </ul>	<ul style="list-style-type: none"> <li>• Adequate problem formulation</li> <li>• Most key issues / variables are identified</li> <li>• Almost all criteria presented for ranking alternatives</li> <li>• Almost all constraints identified</li> <li>• Almost all assumptions identified</li> </ul>	<ul style="list-style-type: none"> <li>• Complete and succinct problem formulation</li> <li>• Key issues / variables identified</li> <li>• All relevant criteria presented for ranking alternatives</li> <li>• All relevant constraints identified</li> <li>• All relevant assumptions identified</li> </ul>
Recognize the need for multiple solutions	<ul style="list-style-type: none"> <li>• Alternative solutions are not presented</li> </ul>	<ul style="list-style-type: none"> <li>• Alternative solutions are not significantly different, i.e., involve only a minor parameter change</li> </ul>	<ul style="list-style-type: none"> <li>• Alternative solutions adequately cover design space</li> <li>• Variety of tradeoffs are presented in alternative solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Alternative solutions cover design space in several significant dimensions</li> <li>• All significant tradeoffs are presented in alternative solutions</li> </ul>
Analyze alternative solutions to an engineering problem	<ul style="list-style-type: none"> <li>• Little analysis</li> <li>• Severely flawed analysis</li> <li>• Criteria not evaluated</li> <li>• Constraints ignored</li> </ul>	<ul style="list-style-type: none"> <li>• Limited analysis of alternatives</li> <li>• Only some criteria evaluated</li> <li>• Only some constraints considered</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate analysis approach</li> <li>• Mostly correct analysis results</li> <li>• Criteria evaluated with minor errors</li> <li>• Constraints considered with minor errors</li> </ul>	<ul style="list-style-type: none"> <li>• Well thought out or clever analysis approach</li> <li>• Complete and correct analysis results</li> <li>• Complete evaluation of design criteria</li> <li>• Complete consideration of constraints</li> </ul>

<p>Justify a solution to an engineering problem</p>	<ul style="list-style-type: none"> <li>• Little discussion of analysis results</li> <li>• Missing documentation of decision making process</li> <li>• Arbitrary choice for final solution</li> </ul>	<ul style="list-style-type: none"> <li>• Weak discussion of analysis results</li> <li>• Missing significant steps in decision making process</li> <li>• Weak justification for final solution</li> </ul>	<ul style="list-style-type: none"> <li>• Adequate discussion of analysis results</li> <li>• Document decision making process</li> <li>• Final solution justified based on design criteria</li> </ul>	<ul style="list-style-type: none"> <li>• Detailed discussion of analysis results</li> <li>• Detailed documentation of decision making process</li> <li>• Clear justification for final solution based on design criteria</li> </ul>
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