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

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>1: Beginning</th>
<th>2: Developing</th>
<th>3: Proficient</th>
<th>4: Exemplary</th>
</tr>
</thead>
</table>
| Formulate the problem and identify key issues/variables | • Missing problem formulation  
• Missing most key issues / variables  
• Missing most criteria  
• Missing most constraints  
• Missing most assumptions | • Weak problem formulation  
• Some issues / variables identified, but many missing  
• Many criteria missing  
• Many constraints missing  
• Many assumptions missing | • Adequate problem formulation  
• Most key issues / variables are identified  
• Almost all criteria presented for ranking alternatives  
• Almost all constraints identified  
• Almost all assumptions identified | • Complete and succinct problem formulation  
• Key issues / variables identified  
• All relevant criteria presented for ranking alternatives  
• All relevant constraints identified  
• All relevant assumptions identified |
| Recognize the need for multiple solutions | • Alternative solutions are not presented | • Alternative solutions are not significantly different, i.e., involve only a minor parameter change | • Alternative solutions adequately cover design space  
• Variety of tradeoffs are presented in alternative solutions | • Alternative solutions cover design space in several significant dimensions  
• All significant tradeoffs are presented in alternative solutions |
| Analyze alternative solutions to an engineering problem | • Little analysis  
• Severely flawed analysis  
• Criteria not evaluated  
• Constraints ignored | • Limited analysis of alternatives  
• Only some criteria evaluated  
• Only some constraints considered | • Appropriate analysis approach  
• Mostly correct analysis results  
• Criteria evaluated with minor errors  
• Constraints considered with minor errors | • Well thought out or clever analysis approach  
• Complete and correct analysis results  
• Complete evaluation of design criteria  
• Complete consideration of constraints |
<table>
<thead>
<tr>
<th>Justify a solution to an engineering problem</th>
<th>Little discussion of analysis results</th>
<th>Weak discussion of analysis results</th>
<th>Adequate discussion of analysis results</th>
<th>Detailed discussion of analysis results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Missing documentation of decision making process</td>
<td>Missing significant steps in decision making process</td>
<td>Document decision making process</td>
<td>Detailed documentation of decision making process</td>
</tr>
<tr>
<td></td>
<td>Arbitrary choice for final solution</td>
<td>Weak justification for final solution</td>
<td>Final solution justified based on design criteria</td>
<td>Clear justification for final solution based on design criteria</td>
</tr>
</tbody>
</table>