

## Rubric Instructions

The scoring rubric is intended to simplify the process of assigning grades, and to increase the likelihood that consistent scores are given for comparable achievement by different groups. The rubric also provides a way to give feedback to students without having to write detailed comments.

The rubric is divided into separate pages corresponding to the main sections of the assignment. Figure 1 is an annotated view of the rubric page for the Overview Statement. Columns in the rubric are associated with one of three levels of performance: *Excellent*, *Satisfactory*, and *Below expectations*. A range of numerical scores is suggested for each of the three performance levels. For example, the table for the Overview Statement has suggested numerical scores of 15 to 20 for Excellent, 8 to 14 points for Satisfactory, and 0 to 7 points for Below expectations. For each level of performance, i.e. for each column, descriptions of performance characteristics are listed next to check boxes. The level of achievement, and hence the numerical score, decreases left-to-right across a row.

Figure 2 is a sample of a completed rubric page. To use the rubric, work across a row from the top to the bottom on each page. Indicate a broad category of performance by checking one of the boxes in the rows. Some of the performance characteristics may not apply to any one report. That's OK. You don't need to check a box in each row. You can also make edits to the text by crossing out descriptions that don't apply, or circling or underlining sections you want to highlight. After you complete the sheet by indicating performance in the rows, make a judgement about the numerical score for that overall category, i.e., for that page. The numerical score will likely require some additional judgement beyond checking boxes for performance measures because individual reports are likely to have a mix of performance. There is a space at the bottom of the page for additional comments.

The sample performance characteristics are intended to make grading more convenient, not limit your expressiveness in evaluating performance or providing feedback. You can also circle or underline parts of the performance characteristics that apply to the report.

Overview Statement: \_\_\_\_\_ out of maximum of 20 points

Excellent (15 to 20 points)	Satisfactory (8 to 14 points)	Below expectations (0 to 7 points)
<input type="checkbox"/> Extremely clear description of mechanisms and system to perform rescue functions.	<input type="checkbox"/> Description of mechanism is understandable, but would be improved by being more detailed or specific.	<input type="checkbox"/> Vague statement of mechanism or system to move mini figure.
<input type="checkbox"/> Conceptual plan is coherent, complete and is likely to be realized within constraints of time and resources.	<input type="checkbox"/> Conceptual plan seems plausible. Some details are not specified. If all goes well the device will be complete by the time of the competition.	<input type="checkbox"/> Conceptual plan is vague or implausible. Little evidence is given that the team can achieve its goals within the time and resource limits.
<input type="checkbox"/> Team has a clear strategy to maximize points in the competition. Tradeoffs have been evaluated and sound choices appear to be made.	<input type="checkbox"/> Strategy is plausible. More detailed description of tradeoffs would be good.	<input type="checkbox"/> Strategy is more about hope, than a concrete plan. No analysis of tradeoffs in scoring in different categories.
<input type="checkbox"/> Team identifies risks in their strategy and has a back-up plan.	<input type="checkbox"/> Some risks in strategy are identified	<input type="checkbox"/> No acknowledgement of risks to current strategy.
<input type="checkbox"/> Automation strategy is clearly described and seems achievable.	<input type="checkbox"/> Automation strategy is mentioned. More details would be helpful.	<input type="checkbox"/> Automation strategy is not addressed, or is not realistic.

← Subcategory for evaluation. Score decreases left to right

Additional Comments:

↪ Level of performance (by column)

Figure 1 Annotated layout of a rubric sheet.

**Overview Statement: \_\_\_\_\_ out of maximum of 20 points**

Excellent (15 to 20 points)	Satisfactory (8 to 14 points)	Below expectations (0 to 7 points)
<input type="checkbox"/> Extremely clear description of mechanisms and system to perform rescue functions. <input checked="" type="checkbox"/> Conceptual plan is coherent, complete and is likely to be realized within constraints of time and resources.	<input checked="" type="checkbox"/> Description of mechanism is understandable, but would be improved by being more detailed or specific. <input type="checkbox"/> Conceptual plan seems plausible. Some details are not specified. If all goes well the device will be complete by the time of the competition.	<input type="checkbox"/> Vague statement of mechanism or system to move mini figure. <input type="checkbox"/> Conceptual plan is vague or implausible. Little evidence is given that the team can achieve its goals within the time and resource limits.
<input type="checkbox"/> Team has a clear strategy to maximize points in the competition. Tradeoffs have been evaluated and sound choices appear to be made. <input type="checkbox"/> Team identifies risks in their strategy and has a back-up plan.	<input checked="" type="checkbox"/> Strategy is plausible. More detailed description of tradeoffs would be good. <input checked="" type="checkbox"/> Some risks in strategy are identified	<input type="checkbox"/> Strategy is more about hope, than a concrete plan. No analysis of tradeoffs in scoring in different categories. <input type="checkbox"/> No acknowledgement of risks to current strategy.
<input type="checkbox"/> Automation strategy is clearly described and seems achievable.	<input type="checkbox"/> Automation strategy is mentioned. More details would be helpful.	<input checked="" type="checkbox"/> Automation strategy is not addressed, or is not realistic.

**Additional Comments:**

*Team needs to at least outline an automation strategy or acknowledge the plan to forfeit all automation points*

Figure 2 Example of a completed rubric sheet.

**Overview Statement: \_\_\_\_\_ out of maximum of 20 points**

Excellent (15 to 20 points)	Satisfactory (8 to 14 points)	Below expectations (0 to 7 points)
<ul style="list-style-type: none"> <li><input type="checkbox"/> Extremely clear description of mechanisms and system to perform rescue functions.</li> <li><input type="checkbox"/> Conceptual plan is coherent, complete and is likely to be realized within constraints of time and resources.</li> <li><input type="checkbox"/> Team has a clear strategy to maximize points in the competition. Tradeoffs have been evaluated and sound choices appear to be made.</li> <li><input type="checkbox"/> Team identifies risks in their strategy and has a back-up plan.</li> <li><input type="checkbox"/> Automation strategy is clearly described and seems achievable.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Description of mechanism is understandable, but would be improved by being more detailed or specific.</li> <li><input type="checkbox"/> Conceptual plan seems plausible. Some details are not specified. If all goes well the device will be complete by the time of the competition.</li> <li><input type="checkbox"/> Strategy is plausible. More detailed description of tradeoffs would be good.</li> <li><input type="checkbox"/> Some risks in strategy are identified</li> <li><input type="checkbox"/> Automation strategy is mentioned. More details would be helpful.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Vague statement of mechanism or system to move mini figure.</li> <li><input type="checkbox"/> Conceptual plan is vague or implausible. Little evidence is given that the team can achieve its goals within the time and resource limits.</li> <li><input type="checkbox"/> Strategy is more about hope, than a concrete plan. No analysis of tradeoffs in scoring in different categories.</li> <li><input type="checkbox"/> No acknowledgement of risks to current strategy.</li> <li><input type="checkbox"/> Automation strategy is not addressed, or is not realistic.</li> </ul>

*Additional Comments:*

Capstone Team \_\_\_\_\_

Faculty Grader \_\_\_\_\_

**Conceptual Design: \_\_\_\_\_ out of maximum of 20 points**

Excellent (20 to 25 points)	Satisfactory (10 to 19 points)	Below expectations (0 to 9 points)
<ul style="list-style-type: none"> <li><input type="checkbox"/> The description of the conceptual design is clear, concise, and easy to understand. The purpose of all key components and their function are explained.</li> <li><input type="checkbox"/> The design concept is complete. The device is very likely to successfully perform all aspects of the rescue mission.</li> <li><input type="checkbox"/> The photograph(s) of the device is (are) well executed (well lit, in focus, well-composed). The choice of photograph makes it easy to understand how the device functions.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> The design concept is described with reasonable clarity. Editing would improve the grammar and prose. Key components of the design are described, though some details may be lacking.</li> <li><input type="checkbox"/> The design concept is mostly complete and probably will be successful in performing most or all functions of the mission.</li> <li><input type="checkbox"/> The photograph(s) is (are) helpful in understanding how the device functions. More photographs, or better technical execution would make it easier to understand how the device functions.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> The description of design concept is poorly written and or incomplete. The function of some key components is not described.</li> <li><input type="checkbox"/> Key functions of the rescue mission are either missing, or poorly implemented. The reader is left to imagine how the device will successfully complete the rescue mission.</li> <li><input type="checkbox"/> Photo(s) is (are) missing or so poorly done that it does not contribute to the reader's understanding of the concept.</li> </ul>

*Additional Comments:*

**Discussion of Unrealized Features: \_\_\_\_\_ out of maximum of 20 points**

Excellent (15 to 20 points)	Satisfactory (8 to 14 points)	Below expectations (0 to 7 points)
<ul style="list-style-type: none"> <li><input type="checkbox"/> New features or components are described that might make significant improvements to the operation of the apparatus. OR, a strong case is made that no additional features or components are necessary.</li> <li><input type="checkbox"/> Any suggested improvements are feasible, would require modest effort, and could be implemented quickly.</li> <li><input type="checkbox"/> The time estimate to implement the new features is realistic and consistent with skills and resources available to the team.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> A list of suggested improvements is given and potential benefits are plausible. There is some uncertainty that these changes can make big improvements in performance.</li> <li><input type="checkbox"/> The suggested improvements would require a significant but feasible effort by the team.</li> <li><input type="checkbox"/> The time estimate to implement the new features is optimistic and/or presumes skills and resources not yet fully realized by, or available to, the team.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Suggested improvements are either not specific or are not likely to have a positive impact.</li> <li><input type="checkbox"/> Suggested improvements would require major changes to the design concept currently implemented by the team.</li> <li><input type="checkbox"/> The time estimate to implement the ideas is unrealistic and/or is wildly inconsistent with skills and resources demonstrated by the team thus far.</li> </ul>

*Additional Comments:*

**Roles and contributions of individuals: \_\_\_\_\_ out of 20 points maximum**

Excellent (15 to 20 points)	Satisfactory (8 to 14 points)	Below expectations (0 to 7 points)
<ul style="list-style-type: none"> <li><input type="checkbox"/> A breakdown of assignments to team members is given. Accountability for completion of individual tasks is apparent.</li> <li><input type="checkbox"/> Effort appears to be reasonably and equitably distributed. All members are engaged in significant contributions to success of the team.</li> <li><input type="checkbox"/> Work assignments to individuals highly correlated with skills, prior experience and ambition of team members.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Several tasks are linked to goals for individual group members.</li> <li><input type="checkbox"/> Everyone appears to be making useful contributions, even if it appears that some members are doing more work than others.</li> <li><input type="checkbox"/> Work assignments to individuals is aligned with skills, prior experience and ambition of team members. Some mismatch or missing skills are evident.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> It is not obvious how tasks are going to be completed.</li> <li><input type="checkbox"/> One or two members are carrying to work of the team.</li> <li><input type="checkbox"/> Work assignments to individuals are not aligned with individual skills or prior experience. It is not clear how the group members can achieve the design goals</li> </ul>

*Additional Comments:*

**Appendix: \_\_\_\_\_ out of maximum of 25 points**

Excellent (13 to 15 points)	Satisfactory (6 to 12 points)	Below expectations (0 to 5 points)
<ul style="list-style-type: none"> <li><input type="checkbox"/> Functional decomposition is detailed, well-aligned with the conceptual design strategy, and clearly demonstrates the design strategy.</li> <li><input type="checkbox"/> All blocks in the functional decomposition use verb-noun pairs. Blocks describe a good level specific of function.</li> <li><input type="checkbox"/> Photos and schematics are well executed and very clearly illustrate all subsystems and key components developed by the team.</li> <li><input type="checkbox"/> Several compelling design sketches are given. Sketches show an evolution of design thinking. A majority of the sketches illustrate practical solutions to some aspect of the design challenge. The sketches show evidence of creative and innovative thinking.</li> <li><input type="checkbox"/> Quantitative or qualitative results of measurements of experiments with the prototype are given. The data is used to support important engineering design decisions.</li> <li><input type="checkbox"/> Semi-analytical models and decision tools clearly support all key design choices made by the team.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Functional decomposition gives an overview of the conceptual design. More detail would be helpful.</li> <li><input type="checkbox"/> Most blocks in the functional decomposition use verb-noun pairs. Blocks could be refined with more specificity.</li> <li><input type="checkbox"/> Photos and schematics are serviceable and show the major subsystems and components developed by the team.</li> <li><input type="checkbox"/> Several design sketches are given. A significant fraction of the sketches illustrates practical solutions to aspects of the design challenge. Sketches show some interesting ideas.</li> <li><input type="checkbox"/> Quantitative or qualitative results of measurements of experiments with the prototype are given. Some use of experimental results in engineering decision-making is given.</li> <li><input type="checkbox"/> Some semi-analytical models and decision tools are used to justify some key design choices made by the team.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Functional decomposition lacks detail or only superficially relates a conceptual design approach.</li> <li><input type="checkbox"/> Blocks in the functional decomposition do not use verb-noun pairs. Blocks are broad and lack specificity.</li> <li><input type="checkbox"/> Photos and schematics are missing or poorly done.</li> <li><input type="checkbox"/> Design sketches are crude and/or show no evolution of the design. Sketches lack practical details.</li> <li><input type="checkbox"/> No results of experiments on the prototype are presented, or any results are not shown to lead to engineering design decisions.</li> <li><input type="checkbox"/> Semi-analytical models and decision tools are missing or poorly or incorrectly used to explain design choices.</li> </ul>

*Additional Comments:*