Activity 19-1	Team Project Needs and Requirements Reviews
Textbook Reference:	
Purpose / Goal:	The Needs and Requirements for each Team's projects are presented and reviewed by the class for several criteria to help direct students toward improved project definition. A review will help teams to clarify or expand upon their initial definition. This is needed to help decompose large complex engineering problems into smaller components.
Materials / Resources Required:	Laptop, paper, pencil, team's filled out "Needs and Requirements spreadsheet"
Time Allocated:	0:40 (10 minutes / team – <=5 minutes to setup/present + up to 5 minutes for classroom discussion

Team Project Needs and Requirements Reviews

Each team will have selected their project, identified a project topic, completed a concept generation and selection cycle prior to this activity. During this time, the students should have been populating their Needs & Requirements spreadsheets.

For this activity, each team will share their Needs & Requirements spreadsheet with the entire class. NO PowerPoint slides are required nor should any be prepared. This activity is not intended to require additional time for the preparation of slides.

Each team will *briefly* explain their project. The team will then present using the Needs & Requirements spreadsheet itself.

Discussion and Assessment

Once a team has presented, the class will discuss the presented needs & requirements and provide informal feedback on the technical aspects of the Needs and Requirements. Constructive criticism and comments should be offered in the "Like/Want More Of" style (or similar) feedback using the tools already learned in this course.

In addition to leveraging the "SMART" framework, the criteria to be considered include:

- Depth & breadth / completeness
  - That they adequately define the project in terms of functionality and capability
  - That there are multiple requirements per need as required to ensure that a need is well defined
  - That there are multiple needs as required to ensure that the overall project scope is well defined and bounded to clearly indicate things that are within the project's scope
- Correctness of the needs and requirements
  - Clarity of wording
  - That the needs reflect the voice of the customer where possible

- Appropriateness
  - That the needs appear to be relevant to the project
  - That the needs to be addressed are reasonable within the project's time frame
  - That the needs are focused on the engineering aspects of the project rather than the "artistic" ones – because this is an engineering course, not because those are not important!
  - That the needs also include human centric elements as appropriate
  - That the listed requirements are helping to define the need
  - That the requirements corresponding to a given need properly align with that need
- That needs are not incorrectly shown as requirements
  - It can be challenging to differentiate needs from requirements
- Ability to define metrics and measurement methods for the Requirements
  - That the requirements clearly measurable with well-defined units and reasonable values

In addition to the above, the class is encouraged to offer suggestions and ideas to the presenting team. I time allows, this can be verbal during the discussion period or by other method afterwards. In this manner all of the teams will help each other successfully advance their projects.

Helpful Information

The following is offered as additional guidance in understanding needs vs. requirements.

Needs

Needs help define the project. It is possible, however, to meet a project's needs and yet not fully satisfy the customer.

The following may help teams clarify their needs:

1. When someone asks "Why?", the answer is usually a need!
2. Needs help articulate the goals of a project.
3. Needs alone do not provide adequate engineering definition to actually complete a project. For example, "We need a bridge across the Hudson River" is not enough definition to explain the recently completed replacement of the Tappan Zee Bridge. The need was unchanged from the original but most of the important requirements changed!
4. Needs that **are** measurable are often really **requirements** masquerading as needs!

Requirements

When a team member proposes a solution and the team feels it is not appropriate, the reason is generally that the proposal fails to meet one or more valid but not yet documented requirements. Simply add those to the list and continue the design process.

When all of the needs have been addressed AND all of the requirements have been met, a project will generally meet the customer's expectations.

The following may help teams clarify their requirements:

1. When someone asks "Why?", the answer is usually a need!
2. Requirements are measureable things derived from the needs.

3. Requirements should help rule **out** certain solutions!
4. "Project" requirements should be separated from "solution" requirements. First focus should be on the project requirements
5. Requirements should include functional items. Functions can be difficult to measure, but it is usually very helpful to the team to find a way to make it measurable. The team should seek to identify what can be quantified for each function.
6. Requirements should be specific and not be ambiguous.
7. Requirements should be traceable to one (or more needs). If there isn't a corresponding need yet – just define and add it!
8. Needs should be prioritized. Not every need is necessarily as important as the others. Some will be "mandatory" without which the project will simply not be usable.
9. Requirements should be prioritized. Not every requirement is necessarily as important as the others. Some will be "mandatory" without which the project will simply not be usable or will not meet the customer's expectations.
10. Requirements should not include the solution. First we define the project's requirements, then we identify solution concepts.