EVALUATION OF PROJECT POTENTIAL FORM

Senior Design XYZ 487/488

Careful project selection improves performance (and grades) of senior design teams by providing better opportunities for students to demonstrate capabilities in course objectives regarding engineering design. Senior-design course objectives support ABET criteria for a capstone design experience.

> "Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints." [1]

> "Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs."[1]

Senior design problems are typically complicated and so involve many needs and performance characteristics with diverse measures of success. As design problems are open-ended, senior design projects should inherently have many (even infinite) possible feasible solutions among which some will be more successful than others. In senior design, students must apply a design process that seeks more than merely a functional solution, but an optimally (or better) performing solution. Furthermore, students must substantiate the decisions leading to this preferred solution with engineering analysis and investigations.

Three aspects of senior-design projects are critical to best serve as an open-ended engineering design problem. Figure 1.1 from Kroll, Condoor, and Jansson[2] presents the design process with these three aspects as main categories of tasks to accomplish: 1) need identification and analysis, 2) conceptual design, and 3) realization. Demonstrating capabilities attained in MUSE courses requires defining a sufficiently challenging engineering problem with multiple measureable objectives for evaluating concepts and performance. The resulting project should incorporate engineering standards and realistic constraints. Concept design includes tasks to research technology, brainstorm, and conduct merit analyses leading to the selection of a single concept to engineer. Realization then transforms a mere concept to a comprehensive set of specifications for a real prototype. The development

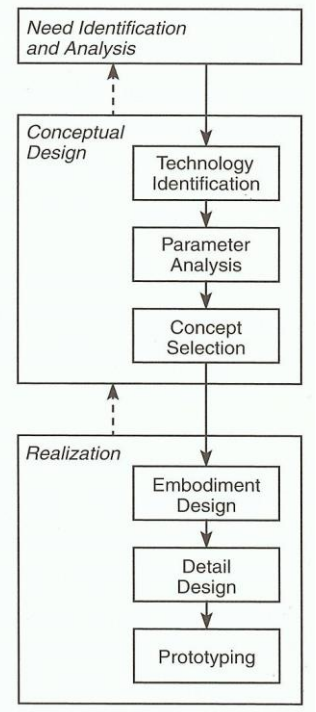

Figure 1.1 Overview of the engineering design process.

[1] www.abet.org ABET Criteria for Accrediting Engineering Programs 2012-13, criterion 5

[2] Kroll, Condoor, and Jansson, *Innovative Conceptual Design, Theory and Applications of Parameter Analysis*, Cambridge, 2001

of final specifications will inevitably require engineering analyses/simulations with appropriate calculations, results interpretation, and discussion.

Please estimate the potential of this project to provide opportunities for performance evaluation, innovation, and engineering analysis. For each, circle only one five options: Low-1 through High-5. Descriptions for options explain sample situations to suggest a general standard.

1) Potential for measureable functionality and performance objectives
   - Low-1 One main general objective for a functioning device
   - 2 Several objectives identified but are difficult to quantify
   - 3 Measureable functionality objectives readily available
   - 4 Measureable performance and functionality objectives readily available
   - High-5 Many performance and functionality specifications predetermined

2) Potential for innovative concept development
   - Low-1 Design components already exist (or likely best solution apparent)
   - 2 Innovation possible but not needed (may lead away from known good solution)
   - 3 Innovation will be required of some components
   - 4 Some solution concepts easily available but without clear preference
   - High-5 No examples of solutions available (or no obvious design alternatives)

3) Potential for engineering analyses (simulations, predictions, etc.) to support decisions
   - Low-1 Design process need not be complicated with analysis
   - 2 Finding aspects of project to analyze may be difficult
   - 3 Many aspects to analyze although not necessarily influential to design
   - 4 A few particular analyses likely to be crucial
   - High-5 Many or advanced analyses likely required