Senior Design Module
Last revised 1/18/2018

http://www.purdue.edu/epics
EPICS can be used to fulfill the BSEE, BSCmpE, CS, EEE, and MDE Senior Design requirements. This module will address:

- Requirements
- What is design?
- Outcomes
- Verification process & documentation
- Importance
- Questions
Requirements

The requirements for Senior Design consist of two parts:

1. Significant design experience on a suitable project
2. Satisfaction of course outcomes by each student
Significant design experience on a suitable project
Appropriate Design Work

There is sometimes a question whether particular work is appropriate design work. To help discern the type of work that is being completed, we have included definitions of the following$^1$:

- Analysis
- Design
- Reproduction

If only one answer to the problem exists, and finding it involves using mathematical/computational models or tools, then the activity is probably analysis.

Examples: simulating the response of a circuit using circuit simulation tools, conducting an experiment to obtain data, or deriving simple equations of motion to determine expected forces.
Design

If more than one solution exists, and if deciding upon a suitable path demands creativity, choice taking, testing, iteration, and evaluation, the activity is most certainly design.

Note: It can include analysis, but it also must involve at least one of these other elements.
Reproduction

Process of recreating something that has already been designed.

Example: copying oscillator circuit from an electronics book and substituting resistor values to set the frequency is an example of reproduction, not design.
More Information About Design

Please keep in mind that “Design” is a complete process from the origin of the project idea through the deployment and maintenance of the project. It includes specification development, conceptual design, detailed design, etc.

More information about the EPICS Design Process can be found at:

Satisfaction of course outcomes by each student:

A student who successfully fulfills the course requirements associated with at least 3 credits of EPICS will ...(see next page)
Senior Design Course Outcomes

i. an ability to apply material from their discipline to the design of community-based projects

ii. an understanding of design as a start-to-finish process

iii. an ability to identify and acquire new knowledge as a part of the problem-solving/design process

iv. an awareness of the customer

v. an ability to function on multidisciplinary teams and an appreciation for the contributions from individuals from multiple disciplines

vi. an ability to communicate effectively with audiences with widely-varying backgrounds

vii. an awareness of professional ethics and responsibility

viii. an appreciation of the role that their discipline can play in social contexts
Verification Process

- Students will demonstrate that they have met the two requirements for Senior Design (significant design experience on a suitable project and satisfaction of course outcomes by each student) by a verification process.
  - Two semester option
  - One semester option

- This is facilitated through three (3) documents:
  - Outcome Matrix - throughout
  - Project Proposal (individual) – at beginning
  - Project Description (team) – at end
Outcomes Matrix

- Purpose: Documents how outcomes have been fulfilled and points to appropriate evidence

- Individual

- Should contain:
  - Specific statements about accomplishments which demonstrate the outcome
  - Specific reference to evidence to support the statement. The references should be complete URLs or specific page numbers

- Students should update and review their Outcomes Matrix with TA and advisor throughout semester(s) to evaluate progress towards senior design outcomes.

- Advisors should provide feedback on the satisfaction of the outcomes, indicating which outcomes have met minimum requirements and which require further work.
Senior Design Outcomes Rubric

- Satisfaction of Outcomes will be assessed by advisor and EPICS administration using the Senior Design Outcomes Rubric:
  
  https://sharepoint.ecn.purdue.edu/epics/teams/Public%20Documents/Senior%20Design%20Outcomes%20Rubric.pdf

- You must demonstrate at least minimal competency in all outcomes to pass the course.
Outcomes Matrix, cont.

- Completed forms should be posted in Senior Design folder of student’s team folder on the Share Point Server (SPS).

- No set amount need to be completed by end of 1\textsuperscript{st} semester for 2 semester students

- All outcomes must be satisfied by the end of the 2\textsuperscript{nd} semester.
Project Proposal:

- **Purpose**: To ensure the project is appropriate and to help plan the achievement of all the outcomes

- **Individual, Follow template!!**  
  - Project Proposal

- **Completed at the beginning**
  - Final Draft due week 7 for two semester students
  - Final Draft due week 2 for one semester students

- Completed forms should be posted in Senior Design folder of student’s team folder on Sharepoint

- Approved by advisor
Purpose: To summarize how outcomes have been met across of senior design students

- One per project, MUST use template!
- Project Description
- 1\textsuperscript{st} Draft due week 7

If it is a continuing project, the Project Description can build on previous semester’s report. However, the current version of the Project Description should accurately reflect what work was completed prior to the student’s activity on the team, what was completed during the student design experience.
Project Description:

- Final approval of Senior Design Project Description must be completed by week 15 by advisor(s).

- This final version should describe the work completed on the project, and not the work that will be accomplished in the future. It should distinguish work completed by previous team members from the work completed by the Senior design students submitting the Project Description.

- Final forms should be posted in Senior Design folder of student’s team folder on the Share Point Server (SPS).

- Project descriptions are included in Semester Senior Design reports to each school and reviewed by Senior Design Committees.
Part (d):

“Description of how the engineering design process is incorporated into the project. Reference must be made to most of the following fundamental steps of the design process: establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation.”

Refer to the steps of the EPICS Design Process, which include the above steps.
Part (e):

“Summary of how realistic design constraints are being incorporated into the project…”

These constraints should be addressed within the following phases and corresponding reports of the EPICS Design Process:

- Project Specification
- Project Conceptual Design
- Project Detail Design
Section (g)

“Description of project deliverables and their final status”

Be clear in stating what were the deliverables, and which were completed and incomplete.
Verification Process

Students will demonstrate that they have met Senior Design requirements by the following verification process:

https://engineering.purdue.edu/EPICS/purdue/individual-documents/senior-design-verification

Please note there are different timelines depending if you are satisfying your senior design requirements over one or two semesters.
<table>
<thead>
<tr>
<th>Reflections and Notebooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ A discussion of meeting an outcome needs to be addressed in your reflections</td>
</tr>
<tr>
<td>■ All technical details of your design needs to be clearly seen in you Notebook.</td>
</tr>
<tr>
<td>□ Not just what you created, but the process that you went through</td>
</tr>
</tbody>
</table>
Important Note

- Evidence (documentation) must be accessible by everyone, as well as in the future.

- In other words – must be on sharepoint, and not a google doc, blog, etc.

- In addition, templates of the Outcome Matrix, Project Proposal, and Project Descriptions can be found on the Forms & Guidelines page.
Grading

■ Instead of submitting Individual Evaluation Rubrics for grading (mid-semester, final), Senior design students submit Outcome Matrices and/or Project Proposal or Project Description (see Verification Process for what is required.)
Keep in mind...

You are responsible for paying attention to how you are doing with respect to the senior design requirements

- Appropriateness of project
- Your role on the project
- Outcomes

If you don’t meet the senior design requirements, you won’t graduate. Discuss concerns with your TA, advisor, and/or EPICS Education Administrator
Where to Get Help

- **ABET requirements:**
  - Your TA and advisor(s)
  - ECE Administrator:
    - Nusaybah Abu-Mulaweh – nabumula@purdue.edu
    - Carla Zoltowski – cbz@purdue.edu
  - AUD Administrator: Prof. Bob Novak
  - MDE Administrator and EPICS Director: Prof. Bill Oakes

- **Senior Design Link on the web:**

- **SharePoint Server operation:**
  - Your TA
  - [Accessing resources link](#)
Questions

Please make sure that you can answer the following questions. If not, you should review the material in this module for the information.

- What document is used to demonstrate that an individual student’s planned role on a project is appropriate for senior design?
- What two major documents are used to demonstrate the Senior Design requirements have been satisfied?
- How many of the outcomes must be satisfied at the end of the two semester period?
Questions, continued

- Does each Senior Design student on a project team need to submit a separate Project Description?
- Who needs to approve the outcomes in the Outcome Matrix?
- True/False: I must achieve at least a “marginal” grade in all outcomes to pass.
- Where should the completed documents be posted/stored?
- True/False: The Senior Design requirements must be fulfilled in order to graduate.
Questions, continued

- True/False: Only work in the “Detailed Design” phase will count towards my senior design requirements.