

ENGR 2020, 3030, and 4040
Service Learning Engineering Design I, II, and III
Fall Semester, 2005

Catalog Data: Service Learning Engineering Design I, II, or III (1)
Credit: 1
Prerequisite: IME102; or ID243 or Permission of instructor.
Corequisite: none

Using the engineering design process to complete a service learning design project. Students will be part of a project team working to provide materials, activities, and training for teaching Science, Technology, Engineering, and Mathematics (STEM) topics in K-12 school settings, or to meet other identified educational needs in the local community.

Textbook: None

Reference Materials: Resource materials located in the Design Center, G254 Parkview Campus. Project work space in room F212 Parkview.

Lecture: Tuesday, 5:30 PM in room D206 Parkview

Coordinator: Dr. Andrew Kline
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Instructors: Dr. Betsy Aller, IME; betsy.aller@wmich.edu
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Activity Assessors: Dr. Mark Jenness and Dr. Cynthia Halderson, SAMPI

Office Hours: Dr. Kline Tuesday 4 to 5 PM; Thursday, 4:30 to 5:30 PM, room A220 Parkview.
Dr. Aller Tuesday 2:30 to 4:00 PM
Other times are by appointment. Please e-mail two business days in advance to schedule.

Prerequisites by Topic:

1. Engineering design process
2. Introduction to the engineering design process
3. Teamwork skills
4. Problem solving skills
5. Written and oral communication methods
6. Engineering and science calculations
7. Using software for engineering calculations and writing technical reports
8. Use and analysis of library or other resource materials

Course Objectives:

1. Interact with client to formulate research plan(s) and assign research tasks
2. Interact with client to write a clear and unambiguous design project problem statement
3. Identify and apply the appropriate analytical approach to design problems
4. Identify a set of 3 design specifications (design constraints and criteria)
5. Generate 2 distinct solution ideas
6. Complete analyses of design possibilities
7. Evaluate and select solution idea(s) for implementation
8. Complete research task related to design project
9. Use engineering tools to build prototype(s)

10. Test the prototype in cooperation with the client, including multiple iterations if time allows
11. Prepare project documentation as necessary
12. Assume role of team members and/or team leader
13. Prepare and make oral presentations on project outcomes to a group of peers, faculty, and the client

Course Topics:

1. Project orientation
2. Preparation for interaction(s) with clients or customers
3. Teaming skills
4. Defining the design project statement
5. Report writing and project documentation
6. Preparing and tracking project budgets
7. Oral presentations
8. Engineering design process
9. Documenting activities using a design notebook

Computer Usage:

Students must be familiar with word processing programs for writing reports and preparing materials for oral presentations. A scientific calculator and spreadsheet software are needed for calculations. Use of process simulator software, engineering drawing programs, or project scheduling software is encouraged.

Grading Scale:	A	92 – 100 %
	BA	88 – 91
	B	80 – 87
	CB	77 – 79
	C	70 – 76
	DC	67 – 69
	D	60 - 66
	E	< 60

Course Evaluation:

Course Evaluation:		Contribution to Final Course Grade
A.	Class attendance	5 %
B.	Participation as team member or leader	10
C.	Individual design notebook	20
D.	Informal oral reports on project progress	10
E.	Written progress reports or other memos	15
F.	Formal final project report	15
G.	Formal final project oral report	15
H.	Faculty evaluation of design deliverable	10
TOTAL		100%

Learning Outcomes:

1. Students will be able to interact with clients and customers to formulate a research plan and assign project research tasks.
2. Students will be able to interact with clients and customers to write a clear and unambiguous design project statement.
3. Students will be able to complete assigned research tasks by due dates to meet design project goals.
4. Students will be able to identify 3 design specifications, constraints, or criteria in support of an assigned design project.
5. Students will be able to generate 2 distinct solution ideas to meet design project goals.
6. Students will be able to complete analyses of aspect(s) of a design project or problem.
7. Students will be able to carry out a project plan.
8. Students will be able to use engineering tools to build a prototype.

9. Students will be able to prepare project documentation.
10. Students will understand and be able to assume the role of a team member working towards solution of a design project.
11. Students will be able to successfully prepare and make oral presentations as instructed on topics related to their team's design project.

This course makes significant contributions to ABET Criterion 3 items a, b, c, d, e, g, and k.
This course is 40% engineering design, 20% engineering science, and 40% engineering practice.

Prepared by: Andrew A. Kline

Date: August 30, 2005

Individual Design Notebook

Students are required to maintain an individual design notebook for the semester long design project. Notebooks will be collected periodically for review and commenting. Notebooks will be either spiral bound, or have a sewn or glued binding. Three-ring binders or other loose-leaf notebooks are not acceptable.

A design notebook is used to record information acquired and ideas developed during the design process.

Design notebook contents: What goes in the design notebook?

- Record your work on the project, including brainstorming, sketches, calculations, designs, and action items.
- Record project meetings, including team sessions and working group (subgroup) sessions. Include agendas, major discussion items, and action items that result from the meeting.
- Record relevant information and discussions from lectures.
- Record contact information (name, phone number, email, address -- whatever is relevant) for people with whom you consult about the project. Record information about conversations with the project partner. Record outcomes from all relevant conversations, including phone and email conversations.
- Use the design notebook to keep detailed records of library and patent searches and to record relevant URLs resulting from WWW searches.
- For software, describe the work done and give the location where the software can be found.
- If documents are too big to insert, note what they contain and where they can be found.
- Include important information that your team has compiled that pertains to the project.
- Include conclusions and recommendations.
- Include enough narrative to explain what is being done; make entries readable by other engineers.

Items that you should be putting in as “inserts” (taping or stapling in so they can be reviewed):

- Agendas and minutes from team meetings.
- Minutes templates from student group meetings where you are the recorder.

Why keep a design notebook?

- The design notebook documents your effort on a project. It is the principal evidence of your individual effort and is therefore an important factor in your course grade.
- Design notebooks may be used in patent and legal evaluations. Factoid: In the U.S., patents are awarded based on evidence of "first to discover"; in most other countries, patents go to the "first to file".
- The design notebook is a useful resource for preparing reports.
- Because of the semester-long nature of the project, the design notebook helps you recall things as the semester progresses.
- Notebooks will be retained by the instructor at the course, as a permanent record of your project results.

Design notebook format

- Put your name, phone number, and email address on the front cover.
- Recommended: Pre-number the pages in the notebook.
- Use ink.
- Date all entries.
- Recommended: Sign each page. This is relevant for patents.
- Tape or staple documents (e.g., handouts, meeting agendas) into the notebook.
- Record directly into the notebook; do not make notes on other pieces of paper and transcribe them into the notebook later. (Exception: computer printouts)
- Write legibly.
- Document calculations as will be discussed in lecture.
- Include narrative text to describe sketches, diagrams, plots, and equations.