



Penn State University
Department of Mechanical & Nuclear Engineering
ME440.3W (was ME415W) - Mechanical Systems Design
Section 3 - Spring 2008

Supervisor: Gary Koopmann
157 Hammond Bldg.
Telephone: 865-2761
Email: Use **Angel email**
Office hours: Thursday after class and by Appt. or drop in

Location: Section 3 meeting
Tu 2:30-5:30 PM 316 Leonhard Building
Th 2:30-3:45 PM 316 Leonhard Building

Web site for general project resources and information: <http://www.me.psu.edu/me415/resources/>
<http://www.lf.psu.edu/>

Course Description:

Students develop skills and techniques for managing and executing engineering design projects. These skills are applied to an industry-sponsored project. Project teams perform all facets of product and process design. This includes problem identification, planning of the project, formulation of design specifications, development and evaluation of alternative conceptual designs, development of detailed designs, specification of manufacturing processes, prototyping of manufacturing processes and parts, and analysis and documentation of results. Students will travel to industrial sites to gain an understanding of existing processes and problems and to assess the customer's needs.

Course Objectives: Upon completing this course, students should be able to:

1. Interact with a customer (boss, co-worker, client) to formulate equitable design criteria (time, cost, quality) for a meaningful engineering project
2. Develop an action plan to complete the project on time and within budget
3. Conceptualize mechanical devices and systems to satisfy design criteria
4. Analyze technical and economic merits of design alternatives
5. Learn to use new evolving engineering tools for analysis, fabrication and management
6. Work effectively in a team that includes co-workers, customers and vendors
7. Communicate well using verbal, written and electronic methods
8. Demonstrate professionalism in interactions with colleagues, faculty, and staff.

Pre-requisites: IE 312, ME340, ME 360 (was ME51), ME 370 (was ME354), ENGL 202C

Optional Text: "Product Design and Development", 3rd or 4th Ed., by Karl T. Ulrich & Steven D. Eppinger.

Grading Table: Final grade will be based on:

ME440W	Oral presentations (5% & 5% - team and individual)	10%
	Written progress reports (team)	05%
	Project Proposal/Statement of Work Report (team)	15%
	Design Specification Report (team)	15%
	Final Project Report (team)	15%
	Poster (team)	05%
	Web Page (team)	05%
	Peer evaluations (3% & 12% - individual)	5%
	Customer [industrial sponsor] evaluation (team)	15%

Course Policies:

- **Academic Integrity:** please refer to <http://www.engr.psu.edu/CurrentStudents/acadinteg.asp> for the College of Engineering's Academic Integrity Policy.
- **Deadlines:** All reports and materials are due at the start of the class period as shown in attached syllabus. Late submissions will NOT be accepted.
- **Grading Disputes:** If a student feels that a report or homework set was graded unfairly or in error, please bring it to my attention within one week after the graded material was handed back. Scores will not be reconsidered after this time period has elapsed.
- **Attendance:** Attendance is expected at the start of each class. As a professional courtesy, please inform the instructor prior to any anticipated legitimate absences. Two absences w/o a reasonable excuse is one letter grade reduction, etc.,. Job interview absences must be previously cleared with all team members and instructor. An absence from oral presentations and when intensive teamwork is necessary is not permitted so plan accordingly. Also see the Faculty Senate Policy on Class Attendance (42-27).
- **Cell Phones:** Turn cell phones off upon entering classroom.

Additional Course Requirements:

- **Project Notebook:** One team member is responsible for organizing and maintaining a project notebook throughout the semester. This can be an E-Notebook using Angel. Also a thin permanently bound working journal (aka-design logbook, record book, notebook) will be kept with drawings, concepts, ideas, & anything discussed regarding the project with dates & initials of those present. The journal is a working document so neatness is not important though it must be legible. This will be reviewed each Tuesday.
- **Progress Reports:** Each team must submit a weekly progress/status report (includes Gantt) to both the project sponsor (via FAX or email) and to the instructor. A "Things-To-Do (TTD)" list with finish dates and responsibility will be discussed each Tuesday with each group. This is usually bulletized or spreadsheet format is about one page in length and describes accomplishments and what is planned in the immediate future. Bring paper copy for instructor's use. Be honest with assessment and be aware that minor delays in the beginning cause major problems at the end.
- **Labor Division:** After the groups have formed members will prepare a document showing division of labor and ground rules. This will be documented in your Journal. Again, teamwork is essential in this class.
- **Literature/Patent Search:** This provides the students with background information and what has been previously done on the topic. The engineering library is a good place to start the literature survey, while the patent search can be quickly done in the patent room in Paterno / Schreyer Business Library 3rd floor or the various free online fetch sites that access USPTO. I would suggest you first use the tutorial online at <http://www.libraries.psu.edu/business/tutorials.htm> prior to your effort, as the tutorial will expedite your searches. They have paper copies and discs in the library covering patents for the last century. Note that patents prior to 1976 will involve a bit more work than later patents. Please don't think that a search on various web sites is sufficient.
- **Resources:** The Learning Factory and the basement of Reber have machine shops for construction. Testing and storage in (Engrg. Unit C, Room 101). Ensure you are certified (see Learning Factory (LF)) to operate equipment prior to starting. Don't miss out on this wonderful opportunity even if your project doesn't require machining. PC's at the LF & ME computer studio should have Microsoft Project for Gantt Charts. PC's with CAD and computational software are available on the first floor of Reber. Solidworks® for solid modeling and shop drawings can also be accessed in 315 Hammond Sunday through Thursday evenings from 7:00PM-11:00PM. Note for planning purposes in Hammond: a T/A will be available for assistance, but be mindful that the room is partially vacant the first 2/3rds of the semester but is full the last 1/3rd.
- **Project Proposal/Statement of Work (SOW) Report:** This report is a selling document and not a highly technical document! It should include executive summary, problem statement, literature/patent searches, project objectives, preliminary design concepts with 3 or more alternatives, budget estimates, Gantt charts, citations etc. See MNE web site "Guidelines for Project Proposals" for details. You will be graded on the Title Page, Table of Contents, Executive Summary, Problem Statement, Technical Approach, Project Management, Deliverables, Budget, Communication with sponsor, Resumes, and References. The SOW, DSR, and Final Report will also have a paragraph addressing how environmental and ethical standards were followed from the start of the project. See Angel site for template and details.
- **Design Specifications Report (DSR):** This report also called a Detailed Design Report (DDR) or Concept Design Review (CoDR), should include executive summary, problem statement, specific design specifications, justification with concept selection matrix, engineering drawings, analysis, manufacturing

process plan, evaluative test procedures, remaining work to do, updated Gantt, budget report, references, and appendix. See Angel site for template and details.

- **Oral Presentations:** Will be judged by the instructor (1/3) and by the students (2/3) on preparation, visual aids, stage presence, and overall effectiveness. Each individual presentation will be about 3 minutes for SOW and 4 minutes for the Final Report with the team's total presentation about 20 –30 minutes with class discussion and reflection afterwards included. Time allotted may vary depending upon groupings and number of groups.
- **Final Report:** This report should include information from the DSR updated solid models, updated shop drawings, unit pictures, test results plus, final economic results, construction details, manufacturing considerations and improvements, conclusions and recommendations. See Angel site for template and details.
- **Design Criteria Satisfaction:** Your end product or process should answer the question whether or not your design demonstrated satisfaction of all of the customer needs. Additionally, it should demonstrate an appreciation of any possible global and societal safety or sustainability needs as well as if any contemporary issues influenced your design. On a scale of 1 to 10 you will be asked to rate your team in the appendix of the Final Report on each and every topic listed above. An accompanying paragraph is necessary for justification.
- **Professionalism:** You should conduct yourself with high professional standards and have an ethical and positive social interaction with the sponsor, team members, LF personnel and instructor. Each absence at any mutually agreed upon out-of-class team meeting or a LF training class that you scheduled yourself to attend will be a loss of half the value noted on the listed grading table.
- **Poster Presentation:** There will be one poster presentation at the project showcase at the end of the semester. Use the Engineering Copy Center in the Engineering Units Building and let them know what ME440W section you are in. Ensure the writing is large and uncluttered. The title, figures, text, names, and conclusions should be able to be read at 4ft away. Dark backgrounds are not recommended. The poster and prototype will be voted upon by the students on which two projects in the section are the best and also contain “wow” appeal.
- **Web page:** It is an executive summary. Therefore it should be limited to one page with an abstract and a picture. See LF web page guidelines for formatting. Use the tools you are familiar with, such as Angel, Weebly, Microsoft FrontPage or Macromedia's Dreamweaver. Confidentiality may be an issue so the sponsor should approve it as a courtesy, if the IP form was needed.
- **Safety:** Start the Learning Factory training class within the first month unless certification from previous ME340 course is verified. Preferably as soon as possible. *Be advised that things always take longer than expected especially if testing or machining is involved so please don't rush a job and cause an accident. Also never believe the results of computer simulation unless some other verification method is employed such as experimentation or back-of-the-envelope calculation.*
- **Reimbursement:** The total limit, including travel expenses, is \$1000 per project with a \$50/vendor/day limit. Anything over \$50 requires Pam Shawver to make the order. It is mandatory to have the original receipts and must be initialed by the instructor prior to submission for reimbursement. Purchase requests should include: your name, local address, email address, team name, and sponsor name. It is highly recommended that you use the credit card with Pam Shawver or Erin Peterson in 314 Leonhard Building as it is the fastest method and least amount of paperwork for you and them. Petty cash of up to \$50 can be gotten weekly. A special check for more money will take about two weeks to process. Meals and taxi in State College and clothing will not be reimbursed. Postage will not be reimbursed, see Pam and it will be mailed by her. Telephone calls should be made from the learning Factory. If you call from your residence, the bills are reimbursable if you have the original phone bill.

Instructor's and Student's Roles: The instructor is there to assist you in locating information and act as a coach or consultant on technical issues, but will not tell you which option to use in your final design. The design problems specified by your sponsor are just the tip of the iceberg. It is your function to further define the problem by discussing this with your sponsor. **Excellent student teamwork and communications are essential in this class!**

Deliverables to the Learning Factory Office (314 Leonhard Bldg.): These requirements must be met before final funds are reimbursed.

- Intellectual Property form (if applicable with sponsored project)
- Copy of poster in PowerPoint® (.ppt) format, plus copies of SOW, DSR & Final Reports in uncompressed PDF format to the Learning Factory office on one burned CD the last week of regular classes.

- A web page executive summary of the project (see <http://www.mne.psu.edu/me415/webtips/index.html> for guidelines). The web page files (everything) must be burned on a CD with an uncompressed 2MB limit. The web pages from previous semesters can be viewed at: http://www.mne.psu.edu/me415/ind_proj.htm. Your web page can be on the same CD as the other reports if there is space available.
- Final poster – mandatory size: 32”x40” foam board, portrait oriented. Posters from previous semesters are on display on the 2nd floor of Reber and the 3rd floor of Leonhard Building.

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316 Leonhard Bldg.

(Note: Course schedule/topic is subject to change)

Rev. -

Week	Date	Topic	Deliverables	Comments
1	Tue 1/15	Meet & greet, course overview / Learning Factory Intro.,		
	Thu 1/17 1:00- 3:00 <u>No reg. class</u>	<i>Project Kickoff Luncheon</i> Luncheon with industry sponsors in the Ballroom @ Nittany Lion Inn, BUSINESS CASUAL DRESS REQ'D.	Project descriptions read, Submit project preferences form by 3:00PM; Prof. assign projects after student submittal	
2	Tue 1/22	Team Organization – Team roles etc. Tips for Students SOW layout Problem formulation/planning/customer needs Don't marry first design Preparation for site visit- objectives???		
	Thu 1/24	First contact with Sponsor – either with visit for local sponsors or teleconference		Prepare a report on outcome of meeting with sponsor
3	Tue 1/29	Staff Meetings – Project Concept Generation/Selection When is/was your site visit/videoconference?	Weekly Status Report	
	Thu 1/31	Effective Proposal writing – Michael Alley	IP Form to LF, 314 Leonhard Bldg.	Assignment #2 – 2 slides
4	Tue 2/5	Staff Meetings	Weekly Status Report	
	Thu 2/7	Solid models and shop drawings		
5	Tue 2/12	Staff Meeting - System Level Design	Weekly Status Report,	
	Thu 2/14	Prepare Statement of Work Draft	Submit SOW Draft to instructor. Assignment #2- 2 Power-Point SOW slides (paper	

			format)	
6	Tue 2/19	Staff meeting Career Fair	Weekly Status Report, Deliverables agreement to LF (314 Leonhard Bldg., Pam Shawver)	
	Thu 2/21	Effective Engineering Presentations Michael Alley	Submit SOW to sponsor	

7	Tue 2/26	SOW presentations	SOW presentations	
	Thu 2/28	TBD		

8	Tue 3/4	Staff Meeting	Weekly Status Report	
	Thu 3/6	Intellectual Property Dr. Richard Weyer (PSU IP Office)		

Spring Break

9	Tue 3/18	Staff Meeting	Weekly Status Report	
	Thu 3/20	Design Specification Report (DSR)	DSR to instructor 3/21	

10	Tue 3/25	Staff Meeting	Weekly Status Report	
	Thu 3/27	Consultation	DSR to sponsor by 3/28	

11	Tue 4/1	Staff Meeting	Weekly Status Report	
	Thu 4/3	TBD		

12	Tue 4/8	Consultation	Weekly Status Report	
	Thu 4/10	Posters Michael Alley		

13	Tue 4/15	Staff Meeting	Weekly Status Report	
	Thu 4/17	Consultation		

14	Tue 4/22	Staff Meeting	Weekly Status Report	
	Thu 4/24	Final report workshop	Web page review	

15	Tue 4/29	Final Project Presentations	Presentations	
	Thu 5/1	Project Showcase HUB Ballroom 11:00A – 12:00P setup 1:00P – 3:00P judging 3:05P -- awards	Poster, prototype, and Final Report + CD	Awards Dinner at the Penn Stater