



**Department of Mechanical Engineering  
ME EN 4000 - Engineering Design I – Fall 2008**

**Syllabus**

<b>Instructor:</b>	<b>Prof. William Provancher</b> , MEB 2136, 581-4119, wil@mech.utah.edu (I greatly prefer you contact me during office hours or by email)
<b>Office Hours:</b>	M, W, F: 11:35pm – 12:00PM (outside of class & in MEB2136) Friday 2-3PM and by appointment (please email in advance)
<b>Units:</b>	3
<b>Meeting Sessions:</b>	Monday, Wednesday, Friday, 10:45am-11:35am, WEB105 (was EMCB)
<b>Engineering Lab:</b>	CADE Lab and Engman Lab
<b>Required Text:</b>	<i>Product Design and Development</i> , Karl Ulrich and Steven Eppinger, McGraw-Hill, 4 <sup>th</sup> Edition (or can use 3 <sup>rd</sup> Edn. or 4 <sup>th</sup> Edn. International Edn.)
<b>Reference Texts:</b>	<ul style="list-style-type: none"><li>• <i>Mechanical Engineering Design</i>, Shigley &amp; Mischke (5<sup>th</sup> Edition)</li><li>• <i>Shigley's Mechanical Engineering Design</i>, Budynas &amp; Nisbett (8<sup>th</sup> Ed.)</li><li>• <i>Fundamentals of Machine Component Design</i>, Juvinall &amp; Marshek</li><li>• <i>Mechanical Design of Machine Elements and Machines</i>, Jack A. Collins.</li><li>• <i>The Mechanical Design Process</i>, David G. Ullman, 3<sup>rd</sup> Edition.</li></ul>
<b>Course Website:</b>	<a href="http://mech.utah.edu/senior_design/08/">http://mech.utah.edu/senior_design/08/</a>
<b>Prerequisites:</b>	ME 3210, 3300, 3650, 3910, Upper Division Status
<b>Course TAs:</b>	<b>Scott Horschel</b> , MEB 2410, shorschel@gmail.com
<b>Office Hours:</b>	TBA
	<b>Will Robinson</b> , Kennecott 143, w.robinson@utah.edu
<b>Office Hours:</b>	TBA
	<b>Scott Teuscher</b> , MEB 2410, 585-7556, scott.teuscher@gmail.com
<b>Office Hours:</b>	TBA
<b>Comm. TAs:</b>	<b>Tina Dyer</b> – Writing TA WEB 1813, 581-4683 (CLEAR Admin. Desk), dyer_tina@hotmail.com
<b>Office Hours:</b>	TBA and arrangement
	<b>Kyle Simmons</b> - Oral Communication & Teamwork TA WEB 1813, 581-4683 (CLEAR Admin. Desk), kyle.simmons@utah.edu
<b>Office Hours:</b>	TBA and arrangement Communications program website: <a href="http://www.coe.utah.edu/clear">http://www.coe.utah.edu/clear</a>

**Course Summary**

This course is the second in a three-course sequence (ME 3910, ME 4000, & ME 4010). It builds directly upon the machine design skills that you have learned in ME EN 3910 and will teach students the basics of the **design process** such as **problem definition, customer requirements, design specifications, concept generation, benchmarking, concept selection, prototyping, design refinement, product architecture, and planning** (time, money, and resources). In ME 4000, students will primarily work on the senior design projects chosen at the end of ME 3910. Students are required to meet with their teammates and project advisors on a weekly basis.

**This course also meets the University's Upper Division Communications Requirement** (otherwise you would be required to take a separate 3 credit technical writing course). As such, ME 4000 also emphasizes effective communication through memos, design documentation, and in-class presentations.

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You will receive some instruction directly related to written and oral communications as well as how to provide and receive constructive criticism.

### Course Objectives (Course learning outcomes)

1. Provide preparation to succeed on your senior design projects
  - a. Learn the design process and apply it to team projects.
  - b. (Re)gain proficiency for basic CAD modeling (team choose 1 program)
2. Learn to effectively define and document your projects and communicate its outcomes
  - a. Learn to communicate effectively (memos, drawings, etc...)
  - b. Present your project for peer review (Learn to take constructive criticism)
3. Work closely with advisor and team TA to develop an engineered product
  - a. Take advantage of advisor's experience (you will often rely on *experts* as a designer)
  - b. Learn to take constructive criticism
4. Learn to effectively manage project resources (budget, project schedule, man power).
  - a. Work effectively as a team
  - b. Learn to plan out, build, and evaluate project prototypes

### TAs

There are 5 TAs associated with the course: one written communications TA, one teamwork and oral communications TA, and three class TAs. Each class TA will be assigned to approximately 8 teams. This TA is your Team TA and will be your primary contact for advice on and grading of assignments. Please use the communications TAs and your Team TA as resources to prepare assignments, memos, the final report, and presentations. Your Team TA can also provide you with technical suggestions, but your faculty advisor and Dr. P are also good resources for technical (engineering) advice on topics ranging from idea generation to manufacturing.

### In-class Exercises (15%)

In the past, it has become apparent that starting a dialogue on various aspects of each project among team members is quite important. It is equally important to create opportunities to ask questions of the teaching team and provide clarifications. To facilitate this, we will have many short 5-10 minute in-class exercises that allow you to start to apply lecture topics to your project. At the start of each day, your team will pick up your team folder from your TA and you will sit with your team in class. You will turn to one or two team mates to complete these exercises. You will put your name and your team-mate's name on the piece of paper you work on and turn these in to your team folders, which you will turn in to your TA after class each day. Making an honest effort on these exercises will earn you a check (a "B") on the assignment. In exceptional cases, higher grades will be awarded by your team TA.

To make up for missing an in-class quiz or "graded" exercise, you may answer the first two questions at the end of the chapter that is associated with that lecture you have missed (these chapters are listed at the bottom of this syllabus). You may make up a maximum of one lecture a week and three lectures in this semester. Your submissions must be a minimum of 1 page. You must submit this make up material by the beginning of the next lecture.

### Classroom conduct

Use of cellular phones and text messaging is strictly prohibited in class. Laptops may only be used to take notes. If you are playing games, browsing the web, emailing, etc., you will be asked to stop or to leave the classroom. This is not respectful towards your classmates or teaching team. Please also keep classroom conversation focused on topics specified for in-class exercises, and quiet down immediately when returning from in-class exercises.

### CAD Tutorials (5%)

The course will include CAD tutorials that are intended to strengthen the student's ability to visualize, analyze and optimize advanced design problems. Students will individually perform a series of

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SolidWorks-based tutorials that teach basic as well as advanced design capabilities. SolidWorks is available in the Engman PC lab in the lower Warnock building or for install on a laptop and license “check-out.” Each tutorial assignment will be assigned on a Wednesday and will generally be due by 5PM on the Wednesday two weeks later (electronically to your TA or to the ME4000 basket in 2110 MEB, main ME office). It is likely that tutorials will be made available early and students may work ahead. CAD tutorials will be assigned every Wednesday starting on 8/27 and will be due every Wednesday starting 9/10.

### **Critical Function Prototype Presentation (CFP) and Final Presentation (20%)**

In the second half of the course, each team will present their CFP. Attendance by the other teams is optional on the days they are not scheduled, but strongly encouraged to help prepare to give an effective presentation. Each presentation will be ~12-15 minutes long plus 15 min. for Q&A. The style of presentation will be as a design review and industry and faculty judges, the instructor, team advisors, and possibly the communications TA will be present. The communications TA will work with the presenters after their presentation to point out ways the presenters can improve. It is strongly encouraged that you work with the TAs and your advisor to prepare an effective presentation. Examples of good presentations from prior years is also available on the course wiki.

The CFP presentations will be based on Powerpoint. All team members must be present for the CFP presentation. Please bring several hardcopies of your presentation to the presentation for the panel judges and email slides to your faculty advisor and your assigned TA before your presentation.

Each group will also give a preliminary presentation outlining the motivation and plans for their CFP(s) to their team TA the week after Fall Break. This presentation can be informal, but should include at most 6 power point slides that use words and graphics to communicate what your project is about, what your CFP(s) will be and what the motivation and plan for your CFP is.

You will also make a final presentation on Research Day (tentatively 9AM – 3PM on Thursday 12/11). This will likely only be a short 10 minute project overview, with a short period for Q&A, and will be presented to a panel of industry judges.

CLEAR TAs and Team TAs will be happy to meet with you to prepare or give a practice presentation in preparation for either the CFP or Final Presentations.

### **Memos**

Each team is responsible for providing their assigned team TA, written communications TA, and their faculty advisor with a periodic memos on specified information. Memos will be focused on specific topics (e.g., a memo specifying your semester deliverables). **Some of these memos must be signed by your advisor to receive credit (or your advisor must send Dr. P and email stating that they have read and approve the contents of your memo).** The memos will generally be due weekly by 5PM on the specified day. Each team is asked to email their memo to their team’s TA, faculty advisor, and if possible to upload the assignment to the teams wiki page.

**Each team member must write at least one memo** (or memo equivalent). Grades for memos will be assigned by the written communications TA and team TAs, so teams are encouraged to meet with them to review their memos before turning them in for credit. Also see the class website for recommended memo content and style. Other opportunities to receive a “memo” grade include writing one of the drafts of the chapters from the group final report.

### **Group Final Report**

Each team will need to submit a final report documenting its project. The report will be based on a word template supplied by the teaching team. The major steps that the report will include are:

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- Executive summary
- Team information
- Complete list of customer requirements.
- Complete list of specifications.
- At least an outline of design development
  - At least provide a product architecture diagram and section numbers for main assemblies and sub-assemblies.
- Preliminary project recommendations as of the end of the semester
- Updated Gantt/Pert chart that reflects the status of the project at the end of this semester.

The grading of the group reports will be based on:

- The overall quality of the project and how well team followed the design process.
- Input from your advisor.

### Grading

CAD tutorials & Homework	5%	Class Participation & Quizes	15%
Critical Function Prototype & Associated Critical Function Prototype Presentations			20%
Memos, Exec. Summary & Section drafts	15%	Group Final Report	15%
Team-mate/Project Grade	15%	Advisor/Project Grade	15%

Grades will be assigned on a straight scale, where 80-83 is a B-, 83-88 is a B, 88-90 is a B+, 90-93 is an A-, and 93-100 is an A. The expected class average will be a B.

Due having limited grading resources, a majority of course assignments will be awarded a check, check-plus, check-minus, or check-minus-minus. These grades equate to an average grade of 85=B, 95, 75, and 50, respectively. You may also just have a numerical score or letter grade recorded on your assignment. Assignments that are more than 3 days late or are not turned in will receive a zero (see late policy below).

### Re-grading Requests for Assignments

Be aware that if requesting a re-grade on an assignment that this assignment should first be brought to the attention of the TA that assigned the grade. Dr. P will look at the assignment if no resolution can be met with the TA, but he will re-grade the entire assignment. On the other hand, if we have simply miss-recorded your assignment, this can be taken care of trivially by bringing your graded assignment to your team TA.

### Returned homework

Please retain your returned graded homework and ensure that grades are properly recorded by checking posted grades on the course website throughout the semester. Though it is unlikely, if the teaching team makes a mistake in recording your grades, it will be trivial to fix if you bring your graded assignment to the TAs when requesting a grade correction.

### Late Policy

A majority of you will turn in your assignments on time, but some of you may choose not to. So, the last time assignments will be accepted is by 5pm three business days after they are due. For example, an assignment which is due on Tuesday will not be accepted after Friday at 5pm (when the ME office closes). Assignments that are not turned in by then will receive a zero. There is no makeup for lost class participation. Late homework, tutorials, memos, and reports will be penalized 10% if they are one day late and an additional 20% for every day they are late after that (if applicable, the weekend days acts as 1 late day). After 3 business days, zero credit will be received. So this means:

- Assignments turned in by 5PM to Dr. P or your TA 1 day late will be reduced by 10%

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- Assignments turned in by 5PM to Dr. P or your TA 2 days late will be reduced by 30%
- Assignments turned in by 5PM to Dr. P or your TA 3 days late will be reduced by 50%.
- No credit will be received after 3 days late.

Clearly, there can be mitigating circumstances or the possibility of a lost assignment, but these exceptions will be treated on a case-by-case basis.

### Policy on collaboration (cheating) (mainly applies to CAD tutorials)

Students are invited to discuss how to complete assignments, however, must complete work independently. If you turn in the same work as someone else, all parties will receive a zero for the assignment. A 2<sup>nd</sup> offense will mean a visit to the ME Dept. Undergrad. Advisor and possible suspension.

### Finalizing Teams

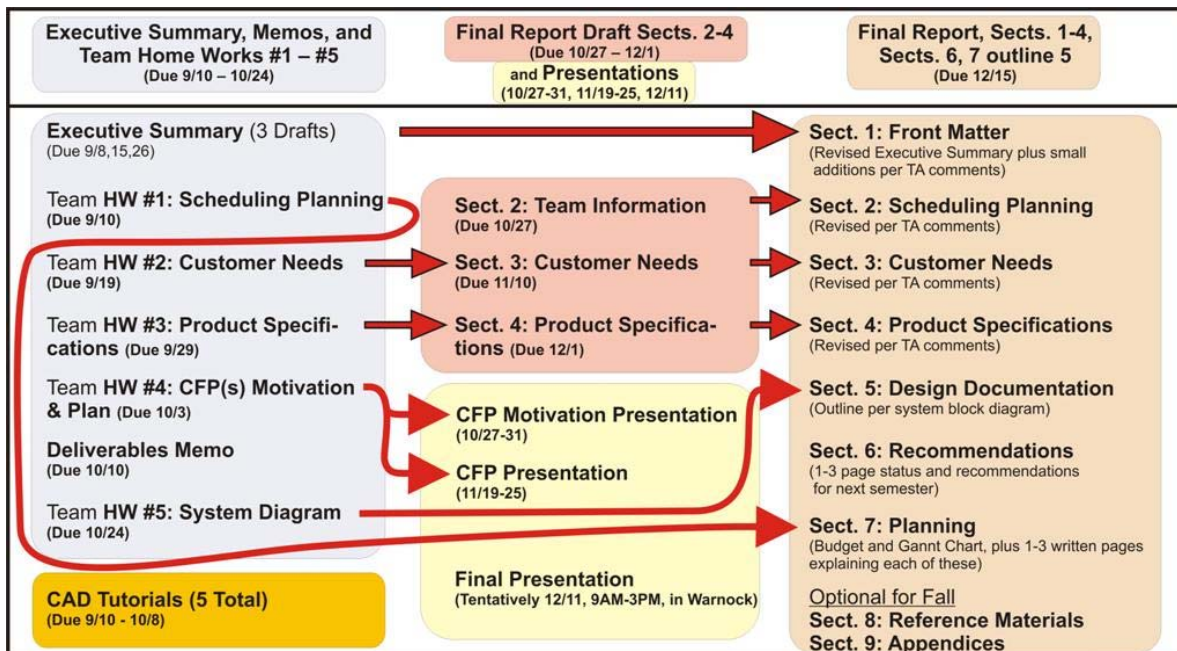
Though it is not encouraged, if shifting teams is necessary it must be cleared with the instructor and respective team advisor and team members. Team sizes under 3 and over 6 are discouraged. Small teams tend to have difficulty keeping up with course assignments. Large teams tend to have organizational issues and difficulties identifying enough interesting work for everyone involved.

### Major Course Assignments

- Executive Summary **First and final hardcopy be signed by faculty advisor** *September 8,15,26*  
Multiple drafts to be completed (team grade)
- Deliverables Memo *October 10*  
Outlining deliverables for Fall and Spring Semesters  
Final hardcopy **must be signed by faculty advisor** (“memo” grade)  
aspects of your project for engineering analysis  
Final hardcopy **must be signed by faculty advisor** (“memo” grade)
- Critical Function Prototype (CFP) and Presentation **Invite Advisor** *Nov. 17-25*  
**Entire team must be present** (signups to be in mid-September)
- Final Report *Dec. 15*  
Complete sections 1-4, 6, 7, outline sect. 5 on design documentation
- Report Chapter Drafts (part of “memo” grade) *Oct. 27 – Dec. 1*

### Smaller Course Assignments

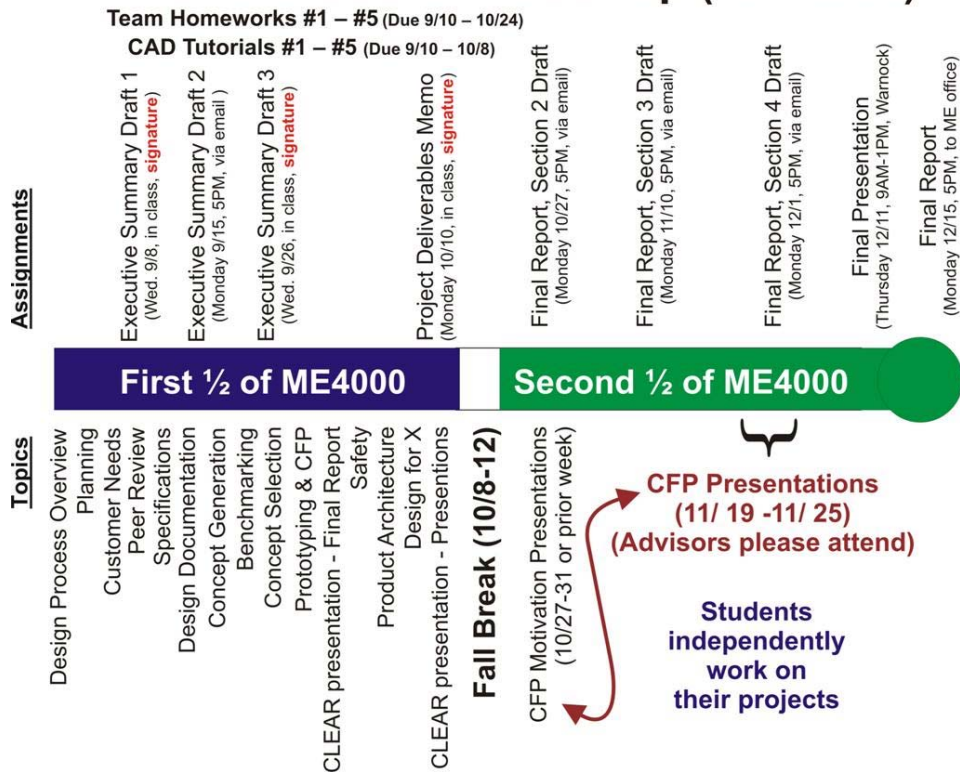
- Class participation *Aug. 20 – Oct. 10*  
Short in-class assignments and quizzes
- CAD tutorials *Sept. 10–Oct. 8*  
5 tutorials to be assigned (may be available for early completion)



**Course Schedule**

Week 1 (Aug. 25)	Welcome, Intro to Design & Methodology, Project Defn.	Chap. 1, 2
Week 2 (9/1)	Planning & Management, Customer Needs	Chap. 16, 4
Week 3 (9/8)	Written Peer Review, Product Specifications, Concept Generation	Chap. 5 & 6
Week 4 (9/15)	Benchmarking, Working Agreements, Design Doc. & Selection	Chap. 6 & 7
Week 5 (9/22)	Team Dynamics, Prototyping, CFP	Chap. 12
Week 6 (9/29)	Oral Peer Review, CLEAR writing presentation (report), Safety	
Week 7 (10/6)	Product Architecture, CLEAR-presentations, Patents, Design for X, Chap.9 & 11	
(10/13)	Fall Break	
Week 8 (10/20)	Work on Project and CFP	(FE exam 10/25)
Week 9 (10/27)	<b>CFP Motivation Presentation</b>	
Week 10 (11/3)	Work on Project and CFP	
Week 11 (11/10)	Work on Project and CFP	
Week 12 (11/17)	<b>CFP Presentations</b> likely Wednesday-Friday	
Week 12 (11/24)	<b>CFP Presentations</b> likely Monday-Tuesday (no class on Wednesday)	
Week 13 (12//1)	Work on Project, report, and final presentation	
Week 14 (12/8)	<b>Final Presentation</b> tentatively at 9AM – 3PM Thursday 12/11 (in Warnock) (teams will be assigned a 15 minute presentation time block during this period)	
Week 15 (12/15)	<b>Final Report due Monday 12/15</b>	

**ME4000 Course Roadmap (Fall 2008)**



**Americans with Disabilities Act of 1990**

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.