ME 382: Introduction to Design
Winter 2014

Course Meeting Time:   Lecture: 12:00 – 12:50 PM MWF, Owen 102
                        Design Laboratory: Th 8AM, 10AM, 12PM, 2PM, Rogers 228

Prerequisites:         ME 248. Co-requisite: ME 250

Professor:            Dr. Bryony DuPont
                        Mechanical Engineering
                        Rogers 216
                        bryony.dupont@oregonstate.edu
                        (541) 737-6462

Office Hours:          Monday, 3-5pm; Tuesday 2-3pm

Teaching Assistants:  Christopher Sharp (8AM) sharpc@onid.orst.edu
                        Office Hours: Tuesdays, 3:30pm, Dearborn 005
                        Bradley Ling (10AM) lingb@onid.orst.edu
                        Office Hours: Mondays, 1pm, Dearborn 005
                        Yesenia Torres (12PM) torresy@onid.orst.edu
                        Office Hours: Tuesdays, 2pm, Covell 240
                        Jonathan Luc (2PM) lucjo@onid.orst.edu
                        Office Hours: Mondays, 1pm, Dearborn 102

Required Textbook:    The Mechanical Design Process by David Ullman
                        3rd Edition or Later (Preferably 4th Ed.)

Course Description:   The goal of this course is to provide a project-based, hands-on discovery experience of
devolving prototype products through a well-organized engineering design process, including
planning, problem definition, conceptual design, product design/realization, and testing. Design
processes and methods are introduced during the lectures; the processes and methods are applied to
a team design project in the design laboratory. Achieving the goals of the course will be measured
through how well students complete the following course objectives.

Course Learning Objectives:
By the end of this course, students will be able to:

1) Apply Gantt Chart techniques to identify project deliverables and make a 10-week work plan
   for a small-scale engineering design team project
2) State and illustrate the Quality Functional Deployment (QFD) to define an open-ended
   engineering design problem
3) Generate and evaluate conceptual design solutions using functional analysis and prototype
   testing given a design problem definition
4) Produce a product that meets functional requirements
5) Produce a product with originality, regulatory, and aesthetic considerations
6) Perform as part of an engineering design team
Design Project:
Teams of four students will be designing and building a lighter-than-air unmanned air vehicle (UAV), following a design statement similar to the annual ASME Student Design Competition 2014 (www.asme.org/events/competitions/student-design-competition). However, the rules and parameters of the UAV design competition for this course will be established by Dr. DuPont and the TAs, and will differ from the ASME’s stated rules. These rules are included on Blackboard (“Design Competition Rules and Questions”) and will be updated* throughout the design clarification portion of the term.

*The professor and TAs will strive to include only solidified rules in the aforementioned document, such that the competition parameters don’t change throughout the course. However, as students become more involved in the design process, clarification and rule-adjustment may be necessary, and these will be incorporated into the rules document as needed.

Grading:
Grading for the course will be based on the following, with a description of each found below:

35%  Homework Assignments (8 total)
25%  Final Project Report
15%  Design Reviews
10%  Final Design Competition Performance
10%  Subjective Evaluation of Final Design
  5%  Design Notebook Completeness

100% Total

Homework Assignments (35%):
Homework assignments (unless otherwise noted) are assigned on Wednesdays and are due prior to the beginning of class the following Wednesday. In an effort to avoid wasting paper, all homework assignments are to be completed digitally (either written by hand and scanned to file, or completed using word/image processing software) and are to be submitted via Blackboard. Students are responsible for the legibility and completeness of their homework files. The filename for each homework assignment must be formatted as follows:

TeamNumber_Lastname_HomeworkNumber
Example: 12_DuPont_HW4 (Where 12 is the team number)

Each assignment must be submitted as a PDF, and the body of the assignment must include the student’s full name, team number, and the student’s Oregon State email address. Assignments will be graded by each lab TA using digital annotation, and will be returned to each student via email. Failure to comply with the stated filename format or the inclusion of the previously stated required information will result in more work for your TA, the delay of the timely returning of your graded work, and will make everyone involved cranky. You don’t want that.

Students will be eligible for up to 100% of each homework grade if they are submitted correctly and on-time (typically Wednesdays by noon). Students will only be eligible for 50% of each homework grade if submission is late up to 24 hours (Thursdays at noon). After 24 hours, no late homework will be accepted.
Final Project Reports (25%):

Students will complete a final project report as a team, a copy of which must be turned in by noon on Monday, March 17 (the Monday of finals week) to Blackboard. The report will be a well-written, complete summary of the team design process and results, consisting of the components listed in the Final Project Report document on Blackboard. It is highly recommended that each team member keep accurate notes of the team’s progress; the combination and refinement of these notes will greatly facilitate the completion of the final project report at the end of the term.

Design Reviews (15%):

There will be three design reviews throughout the course of the semester. These include student presentations during the teams’ design laboratory time on Thursdays.

- Week 4: Preliminary Functional Decomposition-based Prototypes Review
- Week 6: Detailed Design Review (with CAD model presentation)
- Week 9: Final Design Presentation (with fully functional design prototype)

These reviews will be similar to progress presentations given by real-world R&D groups, and will serve as a means to reflect on and display your team’s progress and to ensure you are meeting specified design deadlines. The presentations should be technical in nature and meet the criteria outlined in the Design Review document on Blackboard.

Final Design Competition Performance (10%):

The final design competition is scheduled for Monday, March 10th at 6pm in Milam Auditorium. Students may invite friends and family to the design competition to see the culmination of their hard work. Grading will be based on your team’s design performance, using the scoring scheme outlined in the Design Competition Rules and Questions document. The top-ranked team(s) will receive 100%, and the last place team(s) will receive 60%.

Subjective Evaluation of Final Design (10%):

Each team must turn in their final product prototype to Rogers 228 by noon on Monday, March 10th. The evaluation team will evaluate each product design between 12 pm and 4 pm; after this time, students will be able to pick up their prototypes ahead of the final design competition at 6 pm. Prototypes will be evaluated out of 10 points, corresponding to Design Craftsmanship (3 points), Originality (2 points), Rule compliance (2 points), Aesthetics (2 points), and Design Elegance (1 point).

Design Notebooks (5%)

Students are expected to maintain a professional-style design notebook throughout the term. This should include class notes, notes about the project, any work completed during the design laboratory or while working with your team outside of class, and notes about the homework assignments (homework assignments do not need to be included in this notebook, considering the digital submission process). These notebooks should be permanently bound (i.e. spiral bound and not loose-leaf), contain at least 100 pages, and each page should be numbered in pen, dated, and signed by you upon completion. The cover of your notebook must include your full name, email address, and team number.
The purpose of these notebooks is to keep track of your design process in a deliberate, meaningful way. Originating from “first to prove” patent laws (where an inventor had to prove they came up with an idea prior to their competitors), the sequence of your design ideas in your notebook may be of paramount importance if another team chooses to “steal” your ideas (contributing to a lower originality score for the other team). Given that patent law is now “first to file” instead of “first to prove” - not to mention the electronic cataloging of CAD models by many R&D firms - design notebooks are becoming less vital; regardless, your ability to perform good design bookkeeping is an incredibly important skill. These notebooks will be checked for completeness throughout the term during your design laboratory time.

Expectations:
Students are expected to:
• Attend all lectures. To incentivize your attendance, lecture notes will not be posted to Blackboard.
• Actively participate in class discussion.
• Unless otherwise instructed, do all work independently. Multiple students who turn in obviously similar homework assignments will not get credit for that assignment.
• Meet the Oregon State expectations for student conduct: http://oregonstate.edu/studentconduct/code/index.php#acdis

Statement Regarding Students with Disabilities:
Accommodations are collaborative efforts between students, faculty and Disability Assistance Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at (541) 737-4098.

In Case of Trouble…
If you are experiencing a poor team dynamic, students must work to rectify this situation in a professional manner, according to the design team rules and expectations created during your first team meeting. As an absolute last resort, teams may schedule a meeting with Dr. DuPont to discuss team issues, and she will help determine a suitable outcome for the team.

Course Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Lectures</th>
<th>Reading</th>
<th>Assignment</th>
<th>Design Lab</th>
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<tbody>
<tr>
<td>Week 1</td>
<td><strong>Understanding the Design Process; Project Planning; Product Development Team</strong></td>
<td>Chapters 1-5</td>
<td>- MBTI Assignment (Due Wed, 8 Jan, in class) - HW 1 (Due 15 Jan)</td>
<td>- Team composition - Team building exercises - Make an initial team project plan</td>
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<td><strong>6 Jan – 10 Jan</strong></td>
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<td>Week 2</td>
<td><strong>Design Problem Appraisal</strong></td>
<td>Chapter 6</td>
<td>HW 2 (Due 22 Jan)</td>
<td>- Understand the design problem - Creativity Exercises</td>
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<td><strong>13 Jan – 17 Jan</strong></td>
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<tr>
<td>Week</td>
<td>Dates</td>
<td>Topic</td>
<td>Chapter</td>
<td>HW Due Date</td>
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<td>Week 3</td>
<td>20 Jan – 24 Jan</td>
<td>Concept Generation and Functional Decomposition</td>
<td>Chapter 7</td>
<td>HW 3 (Due 29 Jan)</td>
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<td>Week 4</td>
<td>27 Jan – 31 Jan</td>
<td>Concept Evaluation and Decision Making</td>
<td>Chapter 8</td>
<td>HW 4 (Due 5 Feb)</td>
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<td>Week 5</td>
<td>3 Feb – 7 Feb</td>
<td>Product Generation Drawings, BOM</td>
<td>Chapters 9-10</td>
<td>HW 5 (Due 12 Feb)</td>
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<td>Week 6</td>
<td>10 Feb – 14 Feb</td>
<td>Product Evaluation: Analysis, Design for Manufacture &amp; Assembly</td>
<td>Chapter 12</td>
<td>HW 6 (Due 19 Feb)</td>
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<td>Week 7</td>
<td>17 Feb – 21 Feb</td>
<td>Product Evaluation: Tolerancing and Failure</td>
<td>Chapter 11</td>
<td>HW 7 (Due 26 Feb)</td>
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<td>Week 8</td>
<td>24 Feb – 28 Feb</td>
<td>Product Evaluation: Design for Reliability</td>
<td>Chapter 13</td>
<td>HW 8 (Due 5 Mar)</td>
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<td>Week 9</td>
<td>3 Mar – 7 Mar</td>
<td>Codes and Standards, Design for Assembly</td>
<td>Handouts</td>
<td>Build and Test</td>
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<td>Product, Work on Final DR</td>
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<td>Week 10</td>
<td>10 Mar – 14 Mar</td>
<td>Design for Sustainability, other fun stuff, project post-mortem</td>
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<td>Finals Week</td>
<td>17 Mar – 21 Mar</td>
<td>No Lectures</td>
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<td>Final Project Report: March 17, 12pm</td>
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