ME 4054W Design Projects
Spring Semester 2012
Course Logistics

Prof. David Y. H. Pui
Prof. Brad Bohlmann
January 17, 2012
Resources

• Instructors/Course Coordinators:
  Prof. David Y.H. Pui, ME 3101F, dyhpui@umn.edu
  Prof. Brad Bohlmann, ME 325C, bohlmann@umn.edu

• Teaching Assistants:
  Devin Berg, Shepherd Labs 533, drberg@umn.edu
  Jason Trask, ME L104, tras0011@umn.edu

• Administrator:
  Tori Piorek, ME 2101, (612) 625-6808

• Information regarding office hours and other resources can be found on the course web site
Course Objective

• This class is the capstone design class. It is called “capstone” because it draws on all of your other engineering courses.

• You will go through an open-ended design project experience similar to what you can expect on your job, following graduation.

• The lecture series will present a process which will enable you to identify the optimal solution to such open-ended problems.
Structure

• The course web site is at: http://www.me.umn.edu/courses/me4054/

• The class meets as a whole for the lectures shown on the schedule. You are expected to attend each class meeting.

• The bulk of the course work, however, is focused on your design project. The majority of the time on the class schedule, plus time outside class, is spent working on your project.
Project Teams

• Most of the work in this course will be performed as part of a team assigned to a specific project. Teams are typically six students and one or two advisors.

• There are 28 total projects and descriptions posted on the class web site.

• You express your ranked project preferences on an online form.

• Students are assigned to teams by the course staff based on preference. You will generally get one of your top choices, but even if not, you will be on a good project.
Grading

- The criteria for assessment of the team are:
  - Final Report  *Course Coordinator*  20%
  - Final Design  *Advisor, Design Show Judges, Course Coordinator*  10%
  - Design Documentation  *Course Coordinator*  20%
    - includes intermediate reports such as problem statement, design description, evaluation plan, appendices
  - Project Plan  *Advisor*  10%
    - SOW, WBS, Gantt chart, Design requirements
  - Oral presentations/communication  *Advisor/ Coordinator*  10%
    - site visits, mid presentation, final design show

70% of your grade is based on team performance
Grading

• The criteria for assessment of individuals within the team are:
  – Knowledge of the design process  *Course Coordinator*  10%
    • Midterm exam
  – Design notebook and Google Site Tasks  *Advisor*  15%
  – Individual contribution  *Peers*  5%
    • peer reviews, observations during semester

30% of your grade is based on your individual performance
## Schedule

May change during semester; on-line version is always the most current

### ME4054W Schedule, Spring 2012

<table>
<thead>
<tr>
<th>WK</th>
<th>TUESDAY, 1:25-5:30 PM</th>
<th>THURSDAY, 1:25-5:30 PM</th>
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</thead>
</table>
| 1 Jan 17 | Lecture: Intro to Design  
Lecture: Course Logistics  
Video: ME shop safety  
**Due (by noon Wed 1/18)**: Project Selection | Jan 19  
Project team assignments  
Project Kick-Off Meetings  
**Due:** Resume (bring six copies to mtg) |
| 2 Jan 24 | Lecture: Customer Needs  
Team Meeting | Jan 26  
Lecture: Statement of Work and Product Design Specs  
Team Meeting  
**Due:** Google Site and Project Team Roster (by 11:59 pm) |
| 3 Jan 31 | Lecture/Workshop: Tools for Project Management (Prof. Mantell)  
(team will be assigned a time slot - either 2:30-4:00 or 4:00-5:30)  
Team Meeting | Feb 2  
Lecture: Documenting Your Design  
Team Meeting  
**Due:** Project Plan (1) Statement of Work, (2) Design Requirements, (3) SCanvas, (4) Work Breakdown |
| 4 Feb 7 | Lecture/Workshop: Creativity and Ideation (Prof. Kudrowitz)  
Following lecture, class meets in STSS 312  
(team will be assigned a time slot - either 2:30-4:00 or 4:00-5:30)  
Team Meeting | Feb 9  
Lecture: Concept Selection  
Team Meeting  
**Due:** Project Plan (1) Statement of Work, (2) Design Requirements, (3) SCanvas, (4) Work Breakdown |
| 5 Feb 14 | Site Visits, Day 1  
Team Meeting | Feb 16  
Site Visits, Day 2  
Team Meeting |
| 6 Feb 21 | Lecture: Delivering Effective Presentations (Prof. Durfee)  
Following lecture, class meets in STSS 312  
(team will be assigned a time slot - either 2:30-4:00 or 4:00-5:30)  
Team Meeting | Feb 23  
Lecture: Ethics in Mechanical Engineering  
Team Meeting |
| 7 Feb 28 | Lecture: Intellectual Property (Leza Besemann, UMN OTC)  
Team Meeting | Mar 1  
Team Meeting  
**Due:** Problem Definition Chapter and Supporting Appendix (Design Report Assignment #2, Vol 1 and II) |
| 8 Mar 6 | **Mid-Project Reviews, Day 1**  
Room: ME 321 or ME 1130 (room assignments TBD)  
Team Meeting (Day 2 teams)  
**Due:** Individual Contribution - Notebook and Website (Day 1 teams) | Mar 8  
**Mid-Project Reviews, Day 2**  
Room: ME 321 or ME 1130 (room assignments TBD)  
Team Meeting (Day 1 teams)  
**Due:** Peer Evaluation (All), Individual Contribution - Notebook and Website (Day 2 teams) |
Schedule

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<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Mar 13</td>
<td>Spring Break!</td>
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<td>Mar 19</td>
<td>Midterm Exam: Design Process</td>
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<td>Room: STSS 220</td>
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<td>Team Meeting</td>
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<td>Mar 20</td>
<td>Lecture: Evaluating Your Design</td>
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<td>Team Meeting</td>
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<td>Mar 22</td>
<td>Lecture: Cost and Price of Products</td>
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<td>Team Meeting</td>
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<td>Mar 27</td>
<td>Team Meeting</td>
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<td>Due: Design Description Chapter and Supporting Appendices (Design Report Assignment #3 - see Volume I and II)</td>
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<td>Apr  3</td>
<td>Second Site Visit, Day 1</td>
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<td>Team Meeting</td>
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<td>Apr 10</td>
<td>Lecture: Course Logistics</td>
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<td></td>
<td>Team Meeting</td>
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<tr>
<td>Apr 12</td>
<td>Team Meeting</td>
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<td>Apr 17</td>
<td>Team Meeting</td>
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<td></td>
<td>Due: Design Evaluation (Design Report Assessment #4 - Supporting documents for Design Evaluation are not due at this date just Volume I)</td>
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<td>Apr 19</td>
<td>Lecture: The Design Show</td>
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<td>Team Meeting</td>
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<td>Apr 24</td>
<td>Lecture: Systems Engineering (Rob Schaller)</td>
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<td>Team Meeting</td>
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<td>Apr 26</td>
<td>Team Meeting</td>
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<td>Due on Monday, April 30: Final Design Report (Design Report Assignment #5)</td>
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<td>May  1</td>
<td>Design Show! (Coffman Union Great Hall, Open to public 2-5 PM)</td>
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<td>Due: Design Notebook (give to advisor at Design Show)</td>
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<tr>
<td>May 3</td>
<td>Relax!</td>
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<tr>
<td></td>
<td>Due: Peer Evaluation (All)</td>
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University of Minnesota
Room Assignments

- STSS 220 (Tu, Th 1:25 pm to 2:15 pm)
  - Check lectures or team meetings in Schedule
- STSS 312 (Tu, Th 2:30 pm to 5:30 pm)
  - Tuesday groups use STSS 312 on Tuesday for 3 hours
  - Thursday groups use STSS 312 on Thursday for 3 hours
- ME 321 (Tu 2:30 pm to 3:45 pm)
  - Ad hoc meeting room for Thursday groups
- STSS 330 (Th 2:30 pm to 3:45 pm)
  - Ad hoc meeting room for Tuesday groups
Assignment # 1

• Go to the course web site and use the online form to make your preferred project selections.

• Complete and submit the online project selection form by 11:59 AM on Wednesday, January 18, 2012. You will learn your project assignment and meet with the project advisor at the second class meeting on Thursday, January 19.

• Bring 6 copies of your resume to Thursday’s class.
Shop Safety Training

- For those of you who have not taken the shop safety training, you are asked to stay for the second hour to review a video training tape in STSS 312
- You don’t have to come if you have taken it within 12 months
- After viewing the video, please sign the attendance form
NIST 60 & 100 nm SRM and ISO Standards

ISO/FDIS 15900
Determination of particle size distribution – Differential electrical mobility analysis

ISO/WD 27891
Calibration of aerosol particle number concentration measuring instruments

Mulholland, Pui et al., J. Research NIST 111:257-312 (2006)
Instrumentation Development
## Primary Particle Size Determination

<table>
<thead>
<tr>
<th></th>
<th>$d_p$ from UNPA (nm)</th>
<th>$d_p$ from EM (nm)</th>
<th>Standard deviation from EM (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TiO$_2$ agglomerate</td>
<td>22.8</td>
<td>19.9</td>
<td>7.5</td>
</tr>
<tr>
<td>SiO$_2$ agglomerate</td>
<td>32.5</td>
<td>27.3</td>
<td>9.3</td>
</tr>
<tr>
<td>Diesel particulate</td>
<td>24.2</td>
<td>23.9</td>
<td>6.8</td>
</tr>
</tbody>
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$d_p$ from UNPA is in good agreement with that measured by electron microscopy.