BIOMEDICAL ENGINEERING DESIGN I

BME 4900, Fall 2013
Mondays and Wednesdays 12:20 – 2:20 PM
Gentry 131

INSTRUCTORS
Prof. Donald Peterson, BRON 217, peterson@engr.uconn.edu (Lead Instructor)
Prof. Krystyna Gielo-Perczak, BRON 204, krystyna.gielo-perczak@engr.uconn.edu
Prof. Chen Xu, BRON 210, cxu@engr.uconn.edu
Prof. Patrick Kumavor, BRON 207, dzify@engr.uconn.edu
Prof. Guoan Zheng, BRON 208, gzheng@gmail.com

TEACHING ASSISTANTS
Mr. Joseph Calderan, BRON 201, joseph.calderan@gmail.com (Lead TA)
Ms. Jennifer Etter, BRON 201, jennifer.etter@uconn.edu
Ms. Andrea Mandragouras, BRON 201, amm09016@engr.uconn.edu
Mr. Eduardo Palleras, BRON 201, eduardo.pallares_perez@uconn.edu
Ms. Bahreh Mahrou, BRON 201, bam12006@gmail.edu

COURSE DESCRIPTION
Discussion of the design process; project statement, specifications project planning, scheduling and division of responsibility, ethics in engineering design, safety, environmental considerations, economic constraints, liability, manufacturing, and marketing. Projects are carried out using a team-based approach. Selection and analysis of a design project to be undertaken in BME 4910 is carried out. Written progress reports, a proposal, an interim project report, a final report, and oral presentations are required.

COURSE PRINCIPLES
Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political.

COURSE OBJECTIVES
This course will introduce a variety of design topics including: design of a device, circuit, system, process, or algorithm. It will also focus on introducing aspects of the overall engineering design process including: working on teams, project planning and scheduling (e.g., timelines), technical report writing, proposal writing, oral presentations, ethics in design, safety, liability, impact of economic constraints, environmental considerations, manufacturing and marketing.

Each project is designed, developed, and constructed by a student team, where each student team selects a project that is either a faculty-sponsored project or an industry-sponsored project. Students will also be able to propose a team project BUT student-proposed projects will need to be approved by the course instructors before they are allowed to be undertaken. Student teams, consisting of three students, will be created from the students enrolled in the class. Students will be allowed to select teammates and a balance among tracks in BME is recommended in order to create a team that is multidisciplinary in nature. Every member of the student team is required to enroll in the Machine Shop course, ENGR 3195, so that every team, and team member, has the ability to safely utilize the equipment in the Machine Shop to construct the design. (If you have not done so already, you should register for ENGR 3195.)

After selecting a project, each team will:
• Draft the project specifications and prepare a project proposal based on need and marketing consideration(s)
- Create designs on paper, with extensive modeling and computer analysis
- Create alternative designs (a minimum of three) with a feasibility study on each
- Select an optimal design, with the Client involved in the selection process, and provide a detailed justification of the selection
- Specify components, while targeting off-the-shelf products, and conduct a cost analysis and create a project timeline for completion by the end of the Spring 2014 semester (i.e., end of BME 4910)
- Present an oral report at the end of the semester, where attendance at the presentations is absolutely mandatory for all students.

Upon completion of this course, most students will:
- Create (i.e., layout and fabricate) a Printed Circuit (PC) board using a protocol such as Multisim and soldering circuit elements to PC board
- Use Multisim to design, analyze, and troubleshoot an electric circuit
- Write a LabVIEW interface for any type of signal or display and incorporate the use of various filters to change waveform characteristics in the LabVIEW interface
- Program and use a microprocessor or microcontroller
- Use Autodesk Inventor or SolidWorks to analyze and troubleshoot a mechanical system
- Implement safety and environmental and marketing considerations in the design process

**COURSE MATERIAL**


([http://www.morganclaypool.com/toc/bme/1/1/](http://www.morganclaypool.com/toc/bme/1/1/) - You must be inside the UConn network to access the book)

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([http://www.morganclaypool.com/doi/pdf/10.2200/S00128ED1V01Y200809ENG009](http://www.morganclaypool.com/doi/pdf/10.2200/S00128ED1V01Y200809ENG009) - You must be inside the UConn network to access the book)

([http://www.morganclaypool.com/doi/abs/10.2200/S00075ED1V01Y200612ENG002](http://www.morganclaypool.com/doi/abs/10.2200/S00075ED1V01Y200612ENG002) - You must be inside the UConn network to access the book)

([http://www.morganclaypool.com/doi/abs/10.2200/S00349ED1V01Y201104ENG014](http://www.morganclaypool.com/doi/abs/10.2200/S00349ED1V01Y201104ENG014) - You must be inside the UConn network to access the book)

([http://www.morganclaypool.com/doi/abs/10.2200/S00157ED1V01Y200812BME027](http://www.morganclaypool.com/doi/abs/10.2200/S00157ED1V01Y200812BME027) - You must be inside the UConn network to access the book)
Software: All software protocols are available on the computers in the Engineering Learning Centers or for use on your personal computer by accessing the UConn vPC at http://vpc.uconn.edu/.

Website: Course Material will be posted at: http://www.bme.uconn.edu/sendes/Handouts/index.htm.

GRADING CONTENT

Quizzes: A quiz will be given each week on the previous week's topic (except after student presentations). In particular, a quiz on **ethics** may be given that will be based on the online text above by Monique Frize and material that is common in a philosophy course (e.g., PHIL 1104).

Attendance: MANDATORY!!!

Notebooks: Each student maintains a bound laboratory notebook in which all work is recorded. Each page should be dated and initialed at the bottom of the page.

Grading Scheme: The following scheme will be used to determine a final grade:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Quizzes</td>
<td>10%</td>
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<tr>
<td>Project Statement and Specifications</td>
<td>5%</td>
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<tr>
<td>Design Proposal and Preliminary Design Ideas</td>
<td>10%</td>
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<tr>
<td>Alternate Designs (three minimum) and Analysis</td>
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<tr>
<td>Optimal Design Selection, Analysis, and Justification</td>
<td>10%</td>
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<td>Final Report</td>
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<td>Final Report Oral Presentation</td>
<td>10%</td>
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<tr>
<td>Client Grade</td>
<td>5%</td>
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<tr>
<td>Weekly Reports, Presentations, and Notebooks</td>
<td>10%</td>
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<tr>
<td>Overall Progress on Prototype Development</td>
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<td><strong>Total</strong></td>
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<tr>
<td>WEEK 1</td>
<td>26-Aug</td>
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<td>WEEK 2</td>
<td>2-Sep</td>
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<td>WEEK 3</td>
<td>9-Sep</td>
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<td>WEEK 4</td>
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<td>WEEK 5</td>
<td>23-Sep</td>
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<td>WEEK 6</td>
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<td>28-Oct</td>
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<td>WEEK 11</td>
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<td>WEEK 12</td>
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<td>WEEK 13</td>
<td>18-Nov</td>
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<td>WEEK 14</td>
<td>25-Nov</td>
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<td>WEEK 15</td>
<td>2-Dec</td>
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We ask for your input on the success of the project that is being built for you four times during the spring semester. It is expected that any changes requested by you will be incorporated after discussion between the Team and the Course Instructor. Team Reports are provided weekly at the following website:


As we indicated earlier, the project will undergo changes as we proceed with the construction of the project and we will ask for your input on current progress during the Fall semester. You input at these stages will help the team create a project according to your needs.

The project will be completed in April 2014 and will be delivered to you for testing in April 2014. The Team will update the project each week according to your input. It is very important that all testing be completed by the end of April 2014.

Senior Design Day will be in Gampel Pavilion (tentatively in early May) and your project will be demonstrated during that afternoon and you may pick up the project after 4pm. If you would like, we will have it delivered to you shortly after Senior Design Day.

Check one of the items below and describe the tasks that need to be completed before your acceptance of the project.

- Project Exceeds Expectations
- Project Meets Expectations
- Project Does Not Meet Expectations

Tasks that need to be completed:
WEEKLY TEAM MEETINGS – EXPECTATIONS

During the semester design teams will meet with your faculty advisor and the TA to discuss the project’s progress. The team meetings for BME 4900 start in week 8, and occur all semester for BME 4910. The meetings will occur every week and will last between 15-30 minutes.

Teams will be expected to prepare a 5 minute PowerPoint presentation outlining the following:

- A brief overview of the project (Please include a drawing or image explaining what the final design will look like.)
- Completed work
- Project Review
  - Discuss the successes and hang-ups of the project, and how any issues will affect the project
- Future work (Using Microsoft Project)
  - Discuss the tasks to be completed in the next week
  - Make clear who is responsible for each task
- Budget Update
- Hours Worked by each team member

The second half of the meeting will be with the TA to review your laboratory notebooks. Grading will be as follows:

Grades for the weekly meetings will be assigned as follows:

**Team Grade (5 points):**
Overall progress of the project based on teamwork will be graded between 0 and 5 points.

**Individual Grade (3 points):**
3 – Individual has met or exceeded weekly goal.
2 – Individual has partly met weekly goal, but was delayed with good explanation.
1 – Individual has partly met weekly goal, but was delayed due to lack of planning or effort.
0 – Individual has not completed weekly goal.

**Lab notebook (2 points):**
2 – Notebook is signed and dated on each page. Notes are thorough and clearly written. Print outs are neatly attached to pages with tape or staples.
1 – Notebook is lacking signatures and dates or notes are incomplete or unclear.
0 – Notebook was not updated or not brought to meeting.
Welcome to the Senior Design Lab in Castleman 118. This Lab is your exclusive “club” and you are free to use it as you like for the completion of your projects. However, certain guidelines of cleanliness and professional etiquette will be followed.

Laboratory Access
1) The lab is for the exclusive use of students enrolled in BME 4900 and BME 4910. NO ONE else may use the lab without permission.
2) The door must remain locked at all times. Please do not prop the door for any reason.

Lab Cleanliness
1) The rooms must be kept clean and free of papers, books, and other items.
2) The computer area on each lab bench must also be kept clean.
3) Do not allow the garbage can to pile up to the point where garbage has to lean against the wall – be proactive in keeping the lab clean.
4) ABSOLUTELY no eating or drinking is permitted in the lab
5) The tool cabinet is to be kept organized. ALL TOOLS MUST BE RETURNED AFTER USE. No tools will be allowed to remain at team benches. This is to ensure that everyone has access to all available tools.

Bench Issues
The bench assigned to your team is your private area. Your team members are the only ones allowed to use this area. You should expect that whatever you leave on this bench will remain undisturbed, especially if you are in the midst of a test or build. With this in mind:
1) Do not intrude upon another lab-member’s bench. If you must, seek permission of the lab-member.
2) Do not remove anything from another person’s bench.
3) Never use another lab-member’s electronic equipment without their expressed permission.
4) Never disturb another project for any reason.
5) Keep your bench in a neat and orderly manner.
6) No soldering is permitted on the wooden benches. Please use the soldering benches in FLC 118 the lab for soldering.

Computer Usage
1) Lab computers may be used for work relating to your projects only.
2) Lab computers may not be used to illegally download music, movies, applications, etc. All internet activity is monitored in university labs.
3) No software may be installed without instructor permission. Please fill out the BME Software Request Form (found on the Senior Design website) if you need an application that is not installed. Requests are subject to approval.
4) Students should access “Work Appropriate” websites. Do not view any content that would be considered “Not Safe for Work” (i.e. Pornographic, Violent, Drug, or other offensive content).
5) Do not move any computers, mice, keyboards, monitors, or other peripherals without permission.

Lab equipment and general issues
1) Do not use equipment for reasons other than its intended use.
2) Do not remove any items from the lab.
3) Please be considerate to the environment and print only the most important documents. The lab printer is for Senior Design printing only. Do not print documents for other courses.
4) Please recycle all paper and cardboard in the blue recycling bin.
5) Turn off the lights if you are the last person in the room.

STUDENTS WHO NEGLECT TO FOLLOW THE RULES WILL LOSE LABORATORY PRIVILEGES!