COURSE DESCRIPTION

Course: BE 428 Device and Diagnostic Design
Semester: Spring 2016
Hours: Tuesdays and Thursdays, 2 pm – 4 pm
Location: PHO, Room 201
Website: https://learn.bu.edu

Instructor: Prof. Allison Dennis, Assistant Professor, BME and MSE
Email: aldennis@bu.edu
Office: PHO 916
Office Hours: by appointment

Teaching Fellow: Ms. Catie Gormley, Graduate Research Assistant, BME
Email: cag10@bu.edu
Office: 44 Cummington Mall (ERB)
Office Hours: by appointment

COURSE DESCRIPTION AND APPROACH

BE 428 is a project-based course developing fundamentals of the design aspects of biomedical devices and diagnostics. The course is designed for undergraduates in their Sophomore and Junior years and satisfies a course elective requirement for the Technology Innovation concentration. Case studies of biomedical device designs and hands-on prototyping sessions are used extensively throughout the course. These, as well as guest lectures and discussion sections, are designed to encourage students to consider the broader social contexts of engineering and design. Basic theory, homework, and brainstorming sessions will be applied towards problem identification, materials selection, and failure mode evaluation.

During the first week of class, students will be assigned to Final Project teams. Students will work extensively with their teammates to create a prototype solution to a medical device and/or diagnostic challenge and will provide a written and oral presentation of this work to clinicians, designers, and engineers from BU and the Boston area at the final class session in lieu of a final exam. The Final Project will require intensive teamwork outside of class hours. Due to differences in opinions as well as learning and working styles, individuals in the groups will likely be frustrated, anxious, and/or confused at various times throughout this process. However, they are also expected to develop interpersonal skills including negotiation, communication, trust, creativity, and problem solving, to further the group project goal. Peer evaluations of group progress and cohesiveness will be conducted throughout the course to monitor and deal with any issues that may arise. Ultimately, teams will develop written and oral presentations that they can be proud to use as examples of both their design and teamwork skills in portfolios and career applications.
COURSE OUTCOMES

*Blooms taxonomy: Remember → Understand → Apply → Analyze → Evaluate → Create*

1. Recall design process steps
2. Identify and correct an ineffective design question
3. Develop and revise product design specifications
4. Utilize iterative design and user-centered design methods
5. Critique a design specification based on the design requirements
6. Evaluate designs based on failure modes and effects analysis (FMEA)
7. Work effectively in teams to develop a working model prototype

REQUIRED MATERIALS

*Final Project Group Design Blog*
Starting with the first week that your Final Project Groups are assigned, your group will create a blog that will be updated weekly to keep track of your design progress throughout the course. Design blogs should be updated weekly and include sketches, questions, calculations, photos of concepts and drawings, and ideas. They will enable us (and you) to keep track of progress, meetings, ideas and inventions during the course. Blogs will be assessed periodically throughout the course to evaluate progress. (Check out this site for good host sites: [http://sixrevisions.com/tools/top-free-online-blogging/](http://sixrevisions.com/tools/top-free-online-blogging/); wordpress.com is generally preferred, but Blackboard Learn offers a group blog as well).

*There are no required books for the course*
Instead, links to readings will be available on the course site and books are on reserve for the course in the Science and Engineering library.

SUPPLEMENTAL MATERIALS

*A textbook will be on reserve at the Science and Engineering Library for reference*


*Technology*
Technology is used extensively in the course. Laptops, tablets, smartphones, etc., are welcome in class. I will mention ahead of time when I would like these accessories “shut down” for a lecture or discussion. Please respect these requests, and we will all get more out of class.

EXPECTATIONS AND REQUIREMENTS

*Attendance:* Each week of this course will include a variety of activities: lectures on engineering topics, invited lectures by other professors and researchers working in the medical device field, hands-on
prototyping, discussions, and presentations from your fellow classmates. Thus, it is VERY IMPORTANT to attend every class. You must let us know in advance (via email) if you plan to miss a class, and there is a very high bar for what constitutes a good excuse (“I have a wedding in Idaho,” is not good enough). Being absent for a design review or presentation will result in a 0 grade unless the instructors are notified AHEAD of the listed date and approve the excused absence. An individual presentation may be rescheduled in special cases.

**Blackboard Learn Site:** All course documents, assignments, and announcements will be available on the Blackboard Learn course site for BE 428. Electronic submissions of assignments and evaluations should be to the site. It is your responsibility to ensure that submissions are completed and accepted by Blackboard Learn.

**Academic Honesty:** Plagiarism of ANY KIND will not be tolerated. Any assignment that exhibits plagiarism, copying, cutting and pasting, teamwork when teamwork is precluded, etc., will result in an F (zero credit) on that assignment. Depending on the seriousness of the offense, an F in the course may result. You will be expected to read and sign Boston University’s Academic Conduct Code contract by the second day of this course. The Academic Conduct Code is available at [http://www.bu.edu/academics/policies/academic-conduct-code/](http://www.bu.edu/academics/policies/academic-conduct-code/).

**Communication:** Periodically, anonymous course evaluations may be given to ensure teaching methods are effective and all learning styles are accommodated. Additionally, we are available in person and via email to discuss specific concerns. Peer evaluations of group progress are formally performed at separate times throughout the course. While we are available to mediate major issues, teammates are expected to first communicate with one another about challenges before they become problems, and to support each other throughout the project. Finally, students are expected to take responsibility for their learning and to communicate opportunities for improvement in the course so that they can be addressed. As they say in the diagnostics field, “You can’t fix it, if you don’t know it’s there.”

**Disability Accommodation:** Reasonable accommodations for eligible individuals will be provided in accordance with Boston University policies as described: [http://www.bu.edu/academics/policies/disability-accommodation/](http://www.bu.edu/academics/policies/disability-accommodation/)

**Re-Grading:** requests on exams and assignments must be submitted in writing within one week of grades being returned and only after the solutions are posted. A rationale for re-grading should be included. Points will only be changed for errors made in calculating final scores or grading that did not follow the grading rubric for that assignment.

**Due dates:** All assignments should be handed in by 11:59 pm EST on the day that they are due: electronic copies uploaded to Blackboard Learn site. In the unlikely event that both Blackboard Learn and your printer access should fail at the same time, you may email the assignments to BOTH Instructor and Teaching Assistant. Any assignments handed in late will lose 10% after one day, 25% after two days, and will not be graded after three days.
ASSESSMENT (GRADING)

Your final grade will be determined by a combination of individual and group assignments:

**Individual Assignments** (130 points):
- Blog entries **(15+15 points)**: 1 entry per week; each team member will be in charge of 2 entries over the course of the semester (with input from the whole team)
- Device and Diagnostics Write-up **(40 points)**
- Peer evaluation **(30 points)** (+10 bonus)
- Individual class participation **(30 points)**

**Group Assignments** (200 points):
- PDS **(20 points)**
- Pugh **(20 points)**
- Design Review I + write-up **(40 points)**
- Design Review II + write-up **(40 points)**
- Design Review III + write-up **(40 points)**
- Design Review IV **(10 points)**
- Final Presentation, quality of final prototype **(30 points)**

**Participation and Documentation**: This portion of final grades includes peer evaluations, and group blogs. You are also expected to participate fully in the Final Project and group assignments both by learning from your teammates and by supporting and teaching them. Peer evaluations of contributions to group work will constitute 10% of individual grades on the project. These points are to ensure that students take an active role in the learning process and are fully engaged in all aspects of the course.

**Assignments**: All individual assignments are to be performed separately. Group assignments are to be completed with input and agreement from all teammates; all members of the team will be expected to be able to explain the assumptions and reasoning behind the submitted work. To obtain full credit, any and all assumptions must be stated and full work must be shown for both individual and group assignments.

**Design reviews and reports**: Four separate reviews resulting in a group grade: 10-minute presentations to the class with 5 minutes of discussion for each group, focusing on the assigned review topic. Each presentation + report is worth roughly 10% of the final grade. Written reports parallel the presentations and follow the formatting described in the assignments section of Blackboard Learn.

**Final presentations and reports**: In lieu of a final written report, each group will give 10-minute presentations to clinicians, designers, and engineers from the Boston area with a 5-minute Q&A. This presentation will cover the design question, approach, and development of the Final Project. Team members will evaluate each other for their participation level and quality of work.

**Quality of final prototypes**: Final prototypes from each group will be evaluated against the group’s initial needs statements and design specifications. Do the final proposed solutions meet the design requirements?
IT'S IN THE SYLLABUS

This message brought to you by every instructor that ever lived.

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