COURSE DESCRIPTION AND APPROACH

BE 428 is a project-based course that teaches the fundamentals of the design process for biomedical devices and diagnostics. Basic theory, homework, and brainstorming sessions will be applied towards problem identification, solution selection, and failure mode evaluation. Students will learn about the process through case studies, hands-on prototyping sessions, as well as guest lectures and discussion sections, designed to encourage students to consider the broader contexts of engineering and design.

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 or diagnostic challenge and will provide an 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. Students will develop interpersonal skills including negotiation, communication, trust, creativity, and problem solving, to further the group project goal. Peer evaluations of individual leadership, 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.

EXPECTATIONS AND REQUIREMENTS

Required materials: There are no required books for the course. The students are expected to instead share the costs of prototyping materials over the course of the semester. While BE428 students have access to the Imagineering (Tinker) Lab, please do not try to order BE428 supplies through Tinker. Tinker is not meant to be a lab for this class and the advisors are not supposed to buy supplies for your group projects. Asking them to do so will jeopardize everyone’s access to their space.
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. We expect you to attend every class and you must let us know in advance (via email) if you plan to miss a class; everyone gets a single excused absence (no questions asked), and, of course, please do not come to class if you are ill. Please note that having previously-arranged travel or vacation plans is not a reason to miss class.

Smartphone/electronics policy: We all know how intrusive and distracting phones/smartwatches/tablets/laptops can be. There will be times when I specifically ask you to read a case study online, work on the Citrix server, or look up relevant information for an activity; outside of these times, please do not spend time on your gadgets during lecture. I will mention ahead of time when I would like you to use your electronics. Please respect these requests, and we will all get more out of class; your grade will be affected by non-compliance with these requests.

Blackboard Learn site: All course documents, assignments, and announcements will be available on the Blackboard Learn course site. Submit all assignments and evaluations to the Blackboard site. Just to be clear: submit all assignments and evaluations to the Blackboard site. Do not email them to us. 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 will result in a ZERO score on that assignment. Specifically for this course: there will be an open-book ‘exam’ toward the end of class, for which you will work with a partner to take apart and understand the inner workings of a diagnostic device; even though you are working with a partner, you will have to submit your own write-up. No shared text, Google docs, etc. will be accepted for either partner. Depending on the seriousness of the offense, an F in the course may result. The Academic Conduct Code is available at http://www.bu.edu/eng/current-students/ugrad/faq/.

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

Due dates: All assignments should be submitted by 11:59 pm EST on the day that they are due; electronic copies should be uploaded to Blackboard Learn site. Late assignment lose 10% after one day, 25% after two days, and will not be graded after three days.

Exams and assignments conflicting with other courses: We will work with you to avoid scheduling major assignments when other classes have exams; however, requests to move assignments must be submitted well ahead of time to be considered, and must be written in both English and Italian, using proper grammar and spelling.

Re-Grading: Requests on exams and assignments must be submitted in writing within one week of grades being returned. 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.

Official BU Policy on Re-Grading: “This policy provides a means for a student to contest a final course grade received in a credit-bearing Boston University course when that grade is alleged by the student to be arbitrary. Grading is the prerogative of the faculty and is based upon a student’s performance against a clearly articulated set of assignments, expectations, and standards.

Arbitrary grades are defined as those:
• assigned to a student on some basis other than performance in the course; or,
• assigned to a student by resorting to unreasonable standards different from those which were applied to other students in that course or section of the course; or,
• assigned to a student on the basis of criteria that are a substantial, unreasonable, and unannounced departure from the instructor’s previously articulated standards.

*Issues that do not meet one or more of these criteria of arbitrariness are not appropriate bases for a grade appeal under this policy. Only final course grades may be formally appealed.*

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**ASSESSMENT (GRADING)**

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

**Individual Assignments (30%):**
- Lab journal entries: best 2 (out of 3) entries per team member over the course of the semester
- Device and Diagnostics Write-up
- CAD + CAM assignment

**Peer evaluation (10%)**
- Group work, Rotating leadership.

**Class Participation (10%)**
- Attendance, In-class prototyping sessions, Case studies discussions, Interviews

**Group Assignments (50%):**
- Design Reviews and associated write-ups (30%)
- Final Presentation (10%)
- Technical achievement grade (10%)

**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. *Every assignment has its own rubric on Blackboard: use it to get every last point on every assignment!*

**Final Project Group Design Journal:** Starting with the first week that your Final Project Groups are assigned, you will create a journal to keep track of your design progress throughout the course. Design journals should be updated weekly and include sketches of ideas, questions, calculations, photos and drawings of concepts. They will enable us (and you) to keep track of progress, meetings, ideas and inventions during the course. Journals will be graded weekly.

**Peer evaluation:** 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. Each team member will assume a Team Leader position on a rotating basis, and will be in charge of a design review or the final presentation. The peer evaluation score will include an assessment of each member’s participation level, quality of work, and leadership skills.

**Class Participation:** This portion of final grades includes attendance, active participation during class discussions and prototyping sessions, and the number of interviews conducted. You are also expected to participate fully in providing feedback to other teams during their design review presentations.
class participation grade is based on: attendance (10 points); active participation in class activities (20 points). For attendance, everybody gets a 'free pass' for a single unexplained absence.

*For active participation, the baseline is 10/20. If you demonstrated an above average level of engagement, your score will be higher. Please remember that since the course is graded on a curve, the 10/20 baseline affects everybody equally and does not change the distribution.*

**Design reviews and reports:** 3 separate reviews resulting in a group grade: 8-minute presentations to the class with 2 minutes of discussion for each group focusing on the assigned review topic. Each presentation and associated report is worth 10% of the final grade. Written reports parallel the presentations and follow the formatting described in the assignments section of Blackboard Learn.

**Final presentations:** In lieu of a final written report, each group will present to clinicians, designers, and engineers from the Boston area. You will cover the design question, approach, and development of the Final Project to make the best case for the design you developed.

**Technical achievement:** final prototypes from each group will be evaluated against the group’s initial needs statements and design specifications. *Will your final proposed solutions meet the design requirements?*