

BMEN 4389: SENIOR DESIGN PROJECT II

Fall 2016

F 1:00pm – 3:45pm (Section 001)

SPN 1.121

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Course Description

Project-based capstone design course. Student groups design, build, and test a device that solves an open-ended biomedical engineering design problem. BMEN 4389 focuses on prototype construction and testing. (A prior course, BMEN 4388, focuses on background research and engineering analysis.) As a designated BMEN Writing-Intensive Course, BMEN 4389 also focuses on the refinement of students' engineering communications skills and their use of writing as a critical-thinking and learning tool.

Course Prerequisites

Pre-requisite: BMEN 4388
Co-requisite: None
Other Restrictions: BMEN 4388 and 4389 must be taken in successive semesters

Program Educational Objectives

Biomedical Engineering Bachelor's graduates are expected to attain the following Program Educational Objectives within a few years after graduation:

- Careers that lead to leadership roles in biomedical engineering or related fields
or
- Gain admission to graduate, professional, or health related programs

Course Learning Objectives

- Carry out detailed biomedical component/system-level design, and make decisions using evaluation and analysis tools. (SO k)
- Function in disciplinary or multi-disciplinary teams. (SO d)
- Build and test a working prototype and perform design iterations. (SO e)
- Document, report and present project progress and final results. (SO g)
- Incorporate cost, regulatory, ethical and environmental issues in design. (SO c)

Course Topics

This course is a continuation of BMEN 4388 and focuses on building and testing a proof-of-concept prototype that demonstrates a solution to an engineering design problem. This course will emphasize many of the same concepts and skills introduced in BMEN 4388. Most of the work in the course will be completed outside of the classroom under the direction of the Design Challenge Sponsor and Faculty Advisor. The instructor may occasionally meet with the class as a whole to cover selected topics.

Textbooks and Materials

No textbook is required for this course. In most cases, students will need to research and collect information from sources relevant to their particular project. Textbooks and notes from previous courses will likely be useful additional resources. The following books are recommended as useful references:

1. Ulrich, K. T., & Eppinger, S. D. (2012). Product design and development. New York: McGraw-Hill/Irwin.
2. Rosenau, M. D., & Githens, G. D. (2011). Successful Project Management: A Step-by-Step Approach with Practical Examples. Hoboken: John Wiley & Sons.
3. Ruskin, A. M., & Estes, W. E. (1995). What every engineer should know about project management. New York: M. Dekker.
4. Bowen, H.K. (2002). Project Management Manual. Harvard Business Publishing.

Items 1-3 are available in the UTD library. Item 4 can be ordered online at hbsp.harvard.edu.

Grading Policy

Each student's final grade will be composed of a team and an individual score. Within each of these two categories, deliverables and other items are separately weighted to determine the overall score. Since the team score makes a larger contribution to the final grade, effective teamwork is essential to receiving a good course grade.

The team score is based mostly on the project deliverables that are prepared as a team. All members of a team are typically assigned the same score unless there is evidence of unequal team member contributions. The individual score is derived from assessments of a student's performance by others involved in the project and some individual assignments. The contribution of each item to the overall course grade is summarized in the following two tables:

Team Deliverables & Evaluations	% of Final Grade
Test Plan & Test Results	10
Critical Design Review	5
Formal Design Presentation	5
Project Readiness Review	5
Mandatory First Prototype	10
EXPO	15
Final project report & documentation	10
Weekly reports & other team assignments	5
Design Challenge Sponsor team evaluation	10
Total	75

Individual Performance	% of Final Grade
Peer evaluations (2)	10
Individual reflection & survey	5
Faculty Advisor evaluations (2)	10
Total	25

Overall Performance Multiplier: Each student's individual final numerical score from the above items will be multiplied by an overall performance multiplier to determine the final course grade. The multiplier will be determined based on the Course Instructor's judgment. Normally, this multiplier will be 1.0 and will have no effect on the final grade.

The overall performance multiplier will not be used to quantify fine distinctions in performance. Rather it is intended to allow for a fair grade to be assigned in cases where individual performance is far above or below expectations. For example, in cases where an individual makes extraordinary contributions to the team or produces outstanding work relative to the difficulty level and expectations of their particular project, a multiplier greater than 1.0 may be assigned. On the other hand, poor team member performance will result in a multiplier less than 1.0. Note that in extreme cases this could result in final grades of **F** or **I**, regardless of the overall numerical score. Examples of detrimental behaviors include, but are not limited to, the following:

- Lack of participation in team activities
- Insubordination toward anyone involved in the project
- Unprofessional or unethical conduct (including actions while on project-related travel)
- Misuse of sponsor provided data or equipment
- Extremely poor peer evaluations
- Actions which jeopardize the progress of the project team

The Course Instructor, in consultation with the Faculty Advisor and Design Challenge Sponsor, will have the option to award *team bonus points* equal to 0%-10% of the final grade. This bonus is intended to reward teams that produce outstanding work relative to the difficulty level and expectations of their particular project.

Grade ranges for this class are: A+: 97+; A: 93-96; A-: 90-92; B+: 87-89; B: 83-86; B-:80-82; C+: 77-79; C: 73-76; C-: 70-72; D+: 67-69; D: 63-66; D-: 60-62; F: below 60.

Course Calendar

Below is a brief calendar of lectures and important due dates for the semester. Lecture topics may vary, and occasionally guest lectures will be scheduled at alternative times in replacement of the regularly scheduled lecture time. Dates and information in **red** should be watched closely.

Class Date	Lecture Notes	Topics¹
8/26	Lecture #1	Welcome back! Recap of important topics from SD I, organization of SD II
9/2	N/A	No scheduled class meeting
9/9	N/A	No scheduled class meeting A1 – CDR Slides & Minutes due Sunday 9/11
9/16	N/A	No scheduled class meeting
9/23	All Teams	FORMAL DESIGN PRESENTATIONS
9/30	N/A	No scheduled class meeting
10/7	Individual Teams	PROJECT READINESS REVIEWS PR1 – Peer Review #1 due Sunday 10/9
10/14	N/A	No scheduled class meeting A2 – FDP Review due Sunday 10/16
10/21	N/A	No scheduled class meeting
10/28	N/A	No scheduled class meeting
11/4	Individual Teams	MANDATORY FIRST PROTOTYPE A3 – Test Plan due Sunday 11/6
11/11	N/A	No scheduled class meeting
11/18	Lecture #2	End of semester/project requirements A4 – Individual Reflection due Sunday 11/20 A5 – Project Abstract due Sunday 11/20
11/25		*** Fall Break *** A6 – Expo Poster due Sunday 11/27
12/2	EXPO	*** Senior Design Expo – Friday December 2nd ***
12/9		A7 – Final Project Report due Friday 12/9 U2 – UTDesign survey due Friday 12/9 PR2 – Peer Review #2 due Friday 12/9

¹ Assignments (A1 – A7) and Peer Evals (PR1 and PR2) are due by 11:59pm on the indicated day unless otherwise specified

Course Policies

Teams

Projects will be completed by students working in groups (teams). Each team will work with a Design Challenge Sponsor and a Faculty Advisor. The roles of the Design Challenge Sponsor and Faculty Advisor are strictly advisory. These individuals will not lead the project effort nor will they solve technical problems. It is ultimately the team's responsibility to complete the project and provide the requested deliverables. The assignment of students to teams will remain the same as in BMEN 4388.

Senior Design Expo

At the end of the semester, a time will be scheduled for the public presentation and demonstration of projects. All team members are required to attend and participate in all the events scheduled during this day. Students should plan to be present for the entire duration of the event (approximately 6 hours, 11am – 5pm). **The Senior Design Expo is scheduled for Friday December 2, 2016.**

Communication

You must use your official UTD email account for all email related to this course. Email will also be used by those involved in the course to communicate with you. It is expected that messages sent to the email address on record with the university will be received and read. You should check this email account at least daily so that information from sponsors and the Course Instructor are received and acted upon in a timely manner.

All key course documents and other materials will be available on the UTD course management system ([eLearning](#)) website. Most assignments will also be submitted through this system as well.

Confidentiality & Intellectual Property

Non-disclosure agreements (NDA) and intellectual property (IP) agreements with sponsoring companies signed during BMEN 4388 remain in effect for BMEN 4389.

Confidentiality is a key requirement in most of the projects in this course. Students must always make confidentiality requirements a priority when using computer resources (email, file storage, social media, etc.). Additionally, publically presented materials (presentations, posters, etc.) must be cleared by the sponsor first. Students should always treat sponsor information with care, regardless of the existence of an NDA. In particular, students should make confidentiality requirements a priority when using computer resources (email, file storage, social media, etc.). If you have any doubts, consult your Faculty Advisor or Course Instructor first.

Each team will be assigned a dedicated directory (i.e., folder) on a UTD file server for storage of electronic documents and files related to this course. Because of project confidentiality requirements, all project related materials must be stored in the assigned directory. Do not store confidential documents on personal computers, flash drives, and do not use on-line sharing services such as Google Drive or Dropbox.

Course Assignments & Deliverables

The graded work in this course includes both team deliverables and individual assignments. In addition, there will be evaluations of individual and team performance conducted by the Faculty Advisor, Design Challenge Sponsor and your fellow team members (i.e., peer evaluation). The course assignments along with their requirements and due dates will be posted on eLearning or publicized via email well in advance of the submission deadlines. There will be no formal examination in this course.

No late assignments will be accepted without prior agreement of the Course Instructor. This policy is strictly enforced because it is an integral part of developing the skills expected in the professional community. Teams are advised to have a procedure in place to make sure that team deliverables are submitted on time. A late team deliverable will result in no credit for all team members. Note that computer problems and lack of network access are not acceptable excuses for late submissions. Submitting deliverables well ahead of deadlines is a good way to avoid complications due to unexpected, last-minute problems.

Due to diversity of projects and activities in this course, students are expected to communicate to their Faculty Advisor any issues which they feel may affect their performance in this course. Examples of such issues include difficulties with team members, unresponsiveness of Design Challenge Sponsor, lack of needed resources, etc. If your team feels that circumstances beyond your control will affect your ability to meet a deliverable date, you should consult with your Faculty Advisor and the Course Instructor well in advance of the submission deadline to discuss the situation. Extensions will only be considered in rare circumstances and with proper justification.

Workload

This course will require students to work on realistic and challenging engineering design projects. Consequently, students should expect to spend a considerable amount of time outside of class working on the project. Students should be aware of this requirement and should plan their schedules accordingly. Students with significant extra-curricular obligations (especially jobs) should be aware that they will need to be available to fully participate in all course activities.

Attendance

Attendance at all scheduled class meetings is mandatory. Additionally, you are expected to attend and participate in all meetings with your Design Challenge Sponsor, Faculty Advisor and project team. Poor attendance will impact your individual performance evaluation.

Off-campus Course Activities

Projects in this course will likely involve an occasional need to travel to a sponsor's office or other location for meetings, presentations, site visits, etc. Students are expected to comply with all university policies related to off-campus travel. A link to these policies can be found in the following section. In general, travel reimbursements will not be provided.

Students are expected to conduct themselves with professionalism and comply with all university regulations when traveling or participating in activities at a sponsor's site. Additionally, students are expected to comply with all standard visitor policies and procedures when visiting a sponsor's site. Prior to a visit, students should discuss any special requirements with their Design Challenge Sponsor. In particular, students will need to determine if they will be required to provide personal protective equipment (PPE) for the visit.

Under no circumstances is a student obligated to participate in any off-campus activity which, in their judgment, is unsafe or violates their moral or ethical beliefs. In such circumstances, the student should politely state their preference to not participate. Additionally, sponsors are expected to treat all students equally and respectfully. Students should feel free to report any concerns to the Faculty Advisor or Course Instructor.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.