

Course Outline (F2017)

BME 700: Biomedical Engineering Capstone Design

Coordinator	Dr. Kristiina Mai, P.Eng. Office: ENG318 Phone: (416) 979-5000 ext 6085 Email: kvmai@ryerson.ca Office hours: Thursdays 12:00-1:00
Faculty Lab Coordinators (FLCs)	Dr. Kristiina Mai, P. Eng., Dr. Sridhar Krishnan, P.Eng., Omar Grant, P.Eng., Dr. Stephen Waldman, P.Eng., and Dr. Victor Yang, P.Eng.
Prerequisites	BME 501, BME 516, BLG 601, BLG 701, BME 632, BME 639, BME 674, EES 612, BME 506, BME 423, BME 406 and MTH 410
Compulsory Texts	<i>Teamwork and Project Management</i> , Karl A. Smith, 3 rd edition, McGraw Hill, 2004.
Reference Text	<i>Design of Biomedical Devices and Systems</i> , Paul H. King and Richard C. Fries, 2 nd edition, CRC press, 2008.
Calendar Description	This single term course has two objectives. (1) The lectures provide students with advice on design, project management, reliability, practical advice on software, circuits and components and the documentation of their work. The lectures are organized as a seminar series presented by the faculty lab coordinators and practicing engineering professionals. The seminar series' goal is to provide students with knowledge that will assist them with project design and implementation. (2) The laboratory component of the course provides students with an opportunity to select a project to be completed in the Winter semester course BME 800 Design Project. Students search information, design and source components in consultation with the faculty lab coordinators who will supervise their projects in the Winter term. Students are also encouraged to submit their own topics for approval. Project topics are provided from which students select a topic. Seminars on bioethics will also be arranged.
Learning Objectives	At the end of this course, the successful student will be able to: <ol style="list-style-type: none"> 1. Predict user needs, define design parameters, and identify constraints in the process of defining Engineering Design Project (EDP). (4b)

2. Develop students' ability and technical skills to make decisions in engineering designs using judgment in solving problems with uncertainty and imprecise information, and selecting optimal choice among alternatives applying known constraints identified in the project definition. (4g, 2a)
3. Demonstrates written and oral communication skill through the ability of constructing effective arguments and drawing conclusions using evidence in discussing design choices, using technical vocabulary, and presenting information clearly and concisely. (7a, 7b)
4. Demonstrates team building and project management knowledge through inter-personal skills, team dynamics, understanding of systematically decomposing project into key tasks, determining tasks inter-relationship, and managing project to meet budget and time line. (6b, 11b)
5. Demonstrates the ability to understand the impact of his/her decision and activities on the environment (9a)
6. Demonstrates awareness in considering and applying ethical guidelines in decision making (10a)
7. Demonstrate ability to assimilate existing knowledge of the field, understand how literature is produced and maintain currency (12b)

Note: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board. For more information, see:

http://www.feas.ryerson.ca/quality_assurance/accreditation.pdf

**Course
Organization**

The engineering design projects are selected from a published list of project topics on the course web site. All topics are 3-student projects.

Note: BME students can only choose project topics from BME 700 approved list of projects.

In Weeks 1, 2, and 3 lecture hours, professors teaching this course, the Faculty Lab Coordinators (FLCs) carry out seminars to discuss their project topics available for student selection and the design challenges for those projects, and students carry out independent studies on their interested topics.

In the first half of the semester, a seminar on "Design Process and Project Management" is scheduled.

During the project selection week, Monday to Friday, students must select their project topics on-line using our Department's computers. The procedure of the computer selection will be announced. If more than one group of students selects a particular project topic, the approval of the selection is based on a random process; those who do not get the approval will re-select another topic.

An examination (25% of total course grade) on the subject of Design Process and Project Management will be conducted.

During the second half of the semester, students either attend seminars or carry out design

work in a specific location or laboratory and report to their designated FLC. Seminars are team-taught by the guest speakers or FLCs. These seminars will be scheduled and announced on the course D2L site.

During Weeks 12 and 13, students must do their Oral Exam with their designated FLCs and submit their Final Report.

Hours: 2 hours per week

**Course
Evaluation**

Course evaluation will be based on seminar attendance and quizzes, the exams, students' laboratory performance and design reports.

Design Process and Project Management Exam	25%
Weekly Project Progress	10%
Seminars Attendances and Quizzes	10%
Project Oral Exam	20%
Final written report summarizing design activities	35%

Note: Each project group consists of 3 students. Each student will be evaluated individually and as a group.

Students must submit weekly (Weeks 8 to 11) project progress reports to their FLC for evaluation prior to meeting with their FLCs.

The final written report will be assessed not only on technical merit, but also on the communication skills of the authors as exhibited through all submitted reports. The final written report will be evaluated as follows:

i) *Introduction and Objective*

-Statement of the problem, clarification of need and requirements.

ii) *Approach and Methods*

-Relevant literature review, use of suitable engineering concepts and methods.

iii) *Design Analysis & Synthesis*

-Design specifications, challenges and methodology

-Use of engineering concepts and methods for data gathering, analysis, and synthesis

-Charts on the design process

iv) *Technical Writing, and General Organization*

-English, spelling, conciseness, clarity, cover page, index, sequence of chapters, references, appendices, overall adequacy, and integration of the report.

**Activity
Schedule**

Week	Presenters/ Evaluators	Activities
1	Coordinator	Course Management, EDP Topics
2	FLCs	EDP Topics Presentations
3	FLCs	EDP Topics Presentations
4	FLCs Seminar	Computer Selection of Topics Design Process and Project Management Seminar
5	Coordinator	Design Process and Project Management Exam

6	Staff	Lab Safety Seminar
7	FLCs	Students meet with their assigned FLCs
8	FLCs	Project Milestones submitted to their FLCs
9	Guest Speaker/ FLCs	Seminar/ Lab
10	Guest Speaker/ FLCs	Seminar/ Lab
11	Guest Speaker/ FLCs	Seminar/ Lab
12	FLCs	Project Design Oral Exam
13	FLCs	Project Design Oral Exam, Final Report Submission

**Approved
Projects List**

In order to assist students in selecting a suitable project in Week 4, a list of EDP Topics is posted on the BME 700 course D2L site, and FLCs will carry out seminars to introduce their topics on the list during the first Weeks lecture hours.

**Project Cost,
Equipment, and
Laboratories**

Project costs for components and other supplies will be borne by the students. Some specialized components may be provided by the Department. This will be noted in the project description. Students should carefully assess the cost implications of a particular project before making a commitment. Requests for equipment or laboratory usage outside of your scheduled lab hours should be directed to your FLC.

**Roles of FLC &
FA**

This course presents administrators with a major challenge in coordination. Laboratory resources must be managed to ensure their adequacy, longevity, student safety, and security. Students are to be placed with an FLC who can advise them.

Role of Faculty Laboratory Coordinator (FLC)

- i. Ensure that the minimum 50% design component is in each project under their supervision.
- ii. Provide, where feasible, technical and project management advice without unduly removing the challenge from the student.
- iii. Advise the student, where necessary and possible, in the acquisition of parts, test equipment, and specialized laboratory facilities, as required.
- iv. Monitor the student's weekly progress during the two hours of lab sessions.
- v. Evaluate the overall project results based on performance on their project, milestone demonstration, and design content in the engineering project report.

Role of Faculty Advisor (FA) (if applicable)

The FA is a faculty member who has voluntarily suggested a project or is formally or informally advising the student. When a FA generates a project, the FA is acknowledged in the Engineering Design description. FA generated projects should be approved by the course coordinator and is subjected to agreement of one of the designated FLCs to serve as the supervisor. A FA may or may not be interested in assisting the student beyond the project generation phase. As a courtesy, the student should always discuss the project with the FA when one exists and establish the nature and extent of any advice the FA wishes to provide. Upon project completion, in the Winter Term, it is suggested that the student provide an Engineering Design report copy to the FA if the advisor so wishes. This copy does not have to be bound.

Scope of EDP

The project component BME 700 will make significant demands on the student's time. The key to completing all aspects of this course is to carefully define reasonable limits to what is being undertaken and to budget time on a regular basis to minimize last minute rushes. Two-hour lab sessions per week are assigned in Week 7 to 13. In these lab sessions, the student has the chance to discuss challenges that arise and log their progress in their project with their FLC. As stated earlier, the intended value of the engineering design project is to provide a major experience in engineering design. Therefore, it is important that the project is thoroughly researched and well under way in BME 700 during the Fall Term and a plan of actions for the Winter Term course BME 800 is carefully drawn up. Your FLC may refuse to assist the student who has not made a reasonable effort to solve their problem.

Ultimately, the successful completion of the project is the sole responsibility of the student.

Important Notes

1. All of the required course-specific written reports will be assessed not only on their technical/academic merit, but also on the communication skills exhibited through these reports.
2. Should a student miss an exam or equivalent, with appropriate documentation, a make-up will be scheduled as soon as possible in the same semester. Make-ups should cover the same material as the original assessment but need not be of an identical format. Only if it is not possible to schedule such a make-up may the weight of the missed work be placed on another single assessment. This may not cause that exam or assessment to be worth more than 70% of the student's final grade. If a student misses a scheduled make-up test or exam, the grade may be distributed over other course assessments even if that makes the grade on the final exam worth more than 70% of the final grade in the course.
3. Students who miss a exam for a verifiable reason and who cannot be given a make-up exam prior to the submission of final course grades, must be given a grade of INC (as outlined in the *Grading Promotion and Academic Standing Policy*) and a make-up exam (normally within 2 weeks of the beginning of the next semester) that carries the same weight and measures the same knowledge, must be scheduled.
4. Medical or Compassionate documents for the missing of an exam must be submitted within 3 working days of the exam. Students are responsible for notifying the FLC/course coordinator that they will be missing an exam as soon as possible.
5. Requests for accommodation of specific religious or spiritual observance must be presented to the FLC/ course coordinator no later than two weeks prior to the conflict in question. In extenuating circumstances this deadline may be extended. If the dates are not known well in advance because they are linked to other conditions, requests should be submitted as soon as possible in advance of the required observance. Given that timely requests will prevent difficulties with arranging constructive accommodations, students are strongly encouraged to notify the FLC/course coordinator of an observance accommodation issue within the first two weeks of classes.
6. Students are required to adhere to all relevant University policies including Academic Integrity (http://www.ryerson.ca/content/dam/senate/policies/pol60_Effective_Sept_1_2015.pdf) and Non-Academic Conduct (www.ryerson.ca/senate/policies/pol61.pdf)
7. Students are required to obtain and maintain a Ryerson Matrix e-mail account for timely communications between the instructor and the students.
8. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented.