



**Course Outline (F2018)**

**BME700: Biomedical Engineering Capstone Design**

<b>Instructor(s)</b>	<p>Karthikeyan Umapathy [Coordinator] Office: ENG459 Phone: (416) 979-5000 x 7207 Email: kumapath@ryerson.ca Office Hours: TBA</p> <p>Kristiina Mai Office: ENG318 Phone: (416) 979-5000 x 6085 Email: kvmai@ryerson.ca Office Hours: Fridays 1:00-2:00</p> <p>Sridhar Krishnan Office: ENG369 Phone: (416) 979-5000 x 7548 Email: krishnan@ryerson.ca Office Hours: TBA</p> <p>Stephen Waldman Office: KHS 241N Phone: TBA Email: swaldman@ryerson.ca Office Hours: TBA</p> <p>Victor Yang Office: EPH400L Phone: (416) 979-5000 x 2143 Email: yangv@ryerson.ca Office Hours: TBA</p> <p>Bassma Ghali Office: ENG328 Phone: TBA Email: bghali@ryerson.ca Office Hours: Thursdays 12:00 - 1:00 PM</p> <p>Omar Grant Office: TBA Phone: TBA Email: ogrant@ryerson.ca Office Hours: TBA</p>
<b>Calendar Description</b>	<p>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. Project topics are provided from which students select a topic. Seminars on bioethics will also be arranged.</p>
<b>Prerequisites</b>	<p>BLG 601, BME 501, BME 516, BME 632, BME 639, BME 674, EES 612, BLG 701, BME 506, BME 423, BME 406 and MTH 410</p>
<b>Antirequisites</b>	<p>None</p>
<b>Corerequisites</b>	<p>None</p>

Compulsory Text(s):	1. Teamwork and Project Management, Karl A. Smith, 3rd edition, McGraw Hill, 2004.												
Reference Text(s):	1. Design of Biomedical Devices and Systems, Paul H. King and Richard C. Fries, 2nd edition, CRC press, 2008.												
Learning Objectives (Indicators)	<p>At the end of this course, the successful student will be able to:</p> <ol style="list-style-type: none"> <li>1. Develop ability and technical skills to make decisions in engineering designs using judgment in solving problems with uncertainty and imprecise information. (2a)</li> <li>2. Predict user needs, define design parameters, and identify constraints in the process of defining Engineering Design Project (EDP). (4a)</li> <li>3. Select optimal choice among alternatives applying known constraints identified in the project definition. ( 4c)</li> <li>4. Demonstrates skills to work as a team player and participates towards team effectiveness. (6b)</li> <li>5. Demonstrates skills to work as a team player and participates towards positive team dynamics. (6a)</li> <li>6. Demonstrates written 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)</li> <li>7. Demonstrates 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. (7b)</li> <li>8. Demonstrates the ability to understand the impact of his/her decision and activities on the environment. ( 9a)</li> <li>9. Demonstrates awareness in considering and applying ethical guidelines in decision making. ( 10a)</li> <li>10. Understand systematic decomposition of project into key tasks, determine tasks inter-relationship, and manage project to meet budget and time line. (11b)</li> <li>11. Demonstrate ability to assimilate existing knowledge of the field, understand how literature is produced and maintain currency. (12b)</li> </ol> <p><b>NOTE:</b> Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).</p>												
Course Organization	1.0 hours of lecture per week for 13 weeks 1.0 hours of lab/tutorial per week for 12 weeks												
Teaching Assistants	Not Applicable												
Course Evaluation	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Design Process and Project Management Exam</td> <td style="text-align: right;">25 %</td> </tr> <tr> <td>Weekly Project Progress</td> <td style="text-align: right;">10 %</td> </tr> <tr> <td>Seminars Attendance and Quizzes</td> <td style="text-align: right;">10 %</td> </tr> <tr> <td>Project Oral Exam</td> <td style="text-align: right;">20 %</td> </tr> <tr> <td>Final written report summarizing design activities</td> <td style="text-align: right;">35 %</td> </tr> <tr> <td><b>TOTAL:</b></td> <td style="text-align: right;"><b>100 %</b></td> </tr> </table>	Design Process and Project Management Exam	25 %	Weekly Project Progress	10 %	Seminars Attendance and Quizzes	10 %	Project Oral Exam	20 %	Final written report summarizing design activities	35 %	<b>TOTAL:</b>	<b>100 %</b>
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<p style="text-align: center;"><b>Examinations</b></p>	<p>Design Process and Project Management Exam - Week 6 (tentative)  Project Design Oral Exam – Week 12/13  Final Report Submission – Week 13</p> <p>Course evaluation will be based on students' performance and design reports.</p> <p>Each project group consists of 3 students. Each student will be evaluated individually and as a group.</p> <p>Students must attend specified seminars and submit project milestones (Week 8) and weekly (Weeks 8 to 11) project progress reports to their FLC for evaluation prior to meeting with their FLCs.</p> <p>The final written reports will be assessed not only on their technical merit, but also on the communication skills of their author as exhibited through the reports. The written report will be evaluated as follows:</p> <p>i) Introduction and Objective</p> <ul style="list-style-type: none"> <li>-Statement of the problem, clarification of need and requirements</li> </ul> <p>ii) Approach and Methods</p> <ul style="list-style-type: none"> <li>-Relevant literature review, use of suitable engineering concepts and methods</li> <li>-Alternative design approaches examined and analyzed</li> </ul> <p>iii) Design Analysis and Synthesis</p> <ul style="list-style-type: none"> <li>-Design specifications, challenges and methodology</li> <li>-Use of modern concepts and methods for data gathering, analysis, and synthesis</li> <li>-Charts on the design process</li> </ul> <p>iv) Technical Writing and General Organization</p> <ul style="list-style-type: none"> <li>-English, spelling, conciseness, clarity, cover page, index, sequence of chapters, references, appendices, overall adequacy, and integration of the report</li> </ul>
<p style="text-align: center;"><b>Other Evaluation Information</b></p>	<p>NA</p>
	<p>Course Organization Details  =====</p> <p>The engineering design projects are selected from a published list of project topics on the course D2L web site. The web site description of each of the topics contain a preamble that gives an overview of the project and explains why it is of interest. Partial specifications, objectives, and suggested approach are included. All topics are 3-student projects.</p> <p>Note: BME students can only choose project topics from BME 700 approved list of projects.</p> <p>In lecture hours, professors teaching this course termed 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 studies on their interested topics. If a student(s) wishes to propose (or) modify a topic, the student should first choose the topic(s) closest to their likes from the approved list of BME EDP topics and go through the BME EDP topic selection process. Once they are assigned a topic by the computer selection process, they can then discuss with their assigned FLC to modify their topics subjected to the approval of their respective FLCs.</p> <p>In Week 2 (tentative) lecture hour, a seminar on “Design Process and Project Management” is scheduled.</p> <p>During Week 5 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.</p> <p>In Week 6 (tentative) lecture hours, students must do an examination (25% of total course grade) on the subject of Design Process and Project Management.</p> <p>During Weeks 7 to 11, students either attend seminars or carry out design work in a specific location or laboratory and report to their designated FLC that will be announced on the course D2L web site. Seminars are team-taught by the guest speakers or FLCs. These seminars will be scheduled and announced on the course D2L website.</p>

**Other Information**

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

**Project Cost, Equipment, and Laboratories**  
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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 a FLC and FA**  
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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 a FLC who can advise them.

**Role of Faculty Laboratory Coordinator (FLC)**

1. Ensure that the minimum 50% design component is in each project under their supervision.
2. Provide, where feasible, technical and project management advice without unduly removing the challenge from the student.
3. Advise the student, where necessary and possible, in the acquisition of parts, test equipment, and specialized laboratory facilities, as required.
4. Monitor the student's weekly progress.
5. 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)**

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 the FLC team 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**  
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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. During weekly meetings with FLCs from Week 7 to 13, the student has the chance to discuss challenges that arise and log their progress in their project. 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.

**Course Content**

Week	Hours	Chapters / Section	Topic, description
1-13			Biomedical Engineering Capstone Design

## Laboratory/Tutorials/Activity Schedule

Week	Lab	Description
1	-	Presenters/Evaluators: EDP Coordinator Activities: Course Management, EDP Topics
2	-	Presenters/Evaluators: Seminar Presenters Activities: Design Process and Project Management Seminar, Lab Safety
3	-	Presenters/Evaluators: FLCs Activities: EDP Topics Presentation
4	-	Presenters/Evaluators: FLCs Activities: EDP Topics Presentation
5	-	Presenters/Evaluators: FLCs Activities: Computer Selection of Topics
6	-	Presenters/Evaluators: EDP Coordinator Activities: Design Process and Project Management Exam
7	-	Presenters/Evaluators: FLCs Activities: Students meet with their assigned FLCs
8	-	Presenters/Evaluators: FLCs Activities: Project Milestones submitted to their FLCs
9-11	-	Presenters/Evaluators: Guest Speaker/ FLCs Activities: Seminar/ Lab
12	-	Presenters/Evaluators: FLCs Activities: Project Design Oral Exam
13	-	Presenters/Evaluators: FLCs Activities: Project Design Oral Exam, Final Report Submission

### Policies & Important Information:

1. Students are required to obtain and maintain a Ryerson e-mail account for timely communications between the instructor and the students;
2. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented;
3. Assignments, projects, reports and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO, unless otherwise stated. Marking information will be made available at the time when such course assessment components are announced.

4. If you have taken the course previously and are currently looking to get a laboratory exemption, then you must fill out this form: <http://www.ee.ryerson.ca/guides/ECE-LabExemptionForm.pdf>
5. Refer to our **Departmental FAQ** page for information on common questions and issues at the following link: <https://www.ee.ryerson.ca/guides/Student.Academic.FAQ.html>.

## Missed Classes and/or Evaluations

When possible, students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any consideration and accommodation according to the relevant policies as far in advance as possible. Failure to do so may jeopardize any academic appeals.

1. **Health certificates** - If a student misses the deadline for submitting an assignment, or the date of an exam or other evaluation component for health reasons, they should notify their instructor as soon as possible, and submit a Ryerson Student Health Certificate AND an Academic Consideration Request form within 3 working days of the missed date. Both documents are available at <https://www.ryerson.ca/senate/forms/medical.pdf>. **If you are a full-time or part-time degree student, then you submit your forms to your own program department or school;**
2. **Religious, Aboriginal and Spiritual observance** - If a student needs accommodation because of religious, Aboriginal or spiritual observance, they must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration Request form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the requested absence occurs within the first 2 weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the absence. Both documents are available at [www.ryerson.ca/senate/forms/reobservforminstr.pdf](http://www.ryerson.ca/senate/forms/reobservforminstr.pdf). **If you are a full-time or part-time degree student, then you submit the forms to your own program department or school;**
3. **Academic Accommodation Support** - Before the first graded work is due, students registered with the [Academic Accommodation Support office](http://www.ryerson.ca/studentlearningsupport/academic-accommodation-support) (AAS - [www.ryerson.ca/studentlearningsupport/academic-accommodation-support](http://www.ryerson.ca/studentlearningsupport/academic-accommodation-support)) should provide their instructors with an Academic Accommodation letter that describes their academic accommodation plan.

## Academic Integrity

Ryerson's [Policy 60 \(the Academic Integrity policy\)](#) applies to all students at the University. Forms of academic misconduct include plagiarism, cheating, supplying false information to the University, and other acts. The most common form of academic misconduct is plagiarism - a serious academic offence, with potentially severe penalties and other consequences. It is expected, therefore, that all examinations and work submitted for evaluation and course credit will be the product of each student's individual effort (or an authorized group of students). Submitting the same work for credit to more than one course, without instructor approval, can also be considered a form of plagiarism.

Suspensions of academic misconduct may be referred to the Academic Integrity Office (AIO). Students who are found to have committed academic misconduct will have a Disciplinary Notation (DN) placed on their academic record (not on their transcript) and will normally be assigned one or more of the following penalties:

1. A grade reduction for the work, ranging up to and including a zero on the work (minimum penalty for graduate work is a zero on the work);
2. A grade reduction in the course greater than a zero on the work. (Note that this penalty can only be applied to course components worth 10% or less, and any additional penalty cannot exceed 10% of the final course grade. Students must be given prior notice that such a penalty will be assigned (e.g. in the course outline or on the assignment handout);
3. An F in the course;
4. More serious penalties up to and including expulsion from the University.

The unauthorized use of intellectual property of others, including your professor, for distribution, sale, or profit is expressly prohibited, in accordance with Policy 60 (Sections 2.8 and 2.10). Intellectual property includes, but is not limited to:

1. Slides
2. Lecture notes
3. Presentation materials used in and outside of class
4. Lab manuals
5. Course packs
6. Exams

For more detailed information on these issues, please refer to the [Academic Integrity policy](https://www.ryerson.ca/senate/policies/pol60.pdf) (<https://www.ryerson.ca/senate/policies/pol60.pdf>) and to the Academic Integrity Office website (<https://www.ryerson.ca/academicintegrity/>).

## Important Resources Available at Ryerson

1. [The Library](https://library.ryerson.ca/) (<https://library.ryerson.ca/>) provides research workshops and individual assistance. Inquire at the Reference Desk on the second floor of the library, or go to [library.ryerson.ca/guides/workshops](http://library.ryerson.ca/guides/workshops)
2. [Student Learning Support](https://www.ryerson.ca/studentlearningsupport) (<https://www.ryerson.ca/studentlearningsupport>) offers group-based and individual help with writing, math, study skills and transition support, and other issues.

Approved by: \_\_\_\_\_

Date \_\_\_\_\_

Course Instructor

Approved by: \_\_\_\_\_

Date \_\_\_\_\_

*Associate Chair or Program Director*