Course Outline (W2019)

BME100: Intro to Biomedical Eng

Instructor(s)
Adel Alhalawani [Coordinator]
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Phone: TBA
Email: adel.alhalawani@ryerson.ca
Office Hours: TBA

Calendar Description
This course will deal with the terminology of the medical profession; anatomy and physiology of the human body, from overall system and functional approaches; survey of present-day medical measurements and consideration of those areas in which engineering may be applied advantageously to medicine. The course will also include seminars from guest speakers from biomedical profession. Exposure to medical equipment in hospitals, and small animal handling training will also be provided. Bioethics will also be covered in the course. This course is graded on a pass/fail basis.

Prerequisites
None

Antirequisites
None

Corequisites
None

Compulsory Texts:
1. None

Reference Texts:

Learning Objectives (Indicators)
At the end of this course, the successful student will be able to:

1. Students will be able to improve their knowledge base for natural sciences through research for the project. Further, the in-class quizzes provide students with terminologies to help them recognize and describe terminologies and concepts related to chemistry, biology, etc. (1a)
2. Students will be able to improve their knowledge base for engineering fundamentals through research for the project. The project should present an engineering solution for a medical problem. Further, the in-class quizzes provide students with terminologies that recalls principles and theories in engineering fundamentals such as Newton's laws, mass law, etc. (1c)
3. Students will, by the end of the course, recognize medical terminologies that helps them converse with scientists, physicians and engineers. This aims to prepare the students for the medical and biology related courses in the 2nd year of their studies. (1d)
4. Demonstrate the ability to work in a team and quantify individual and group project contributions. (6a)
5. For the project report, students must select a topic that is current and developing. The topics selected are evaluated for their relevance to the public interest. (8b)
6. The project report must be based on a current biomedical problem. The results of the project should explain the impact of the project on environment. (9a)
7. Demonstrate knowledge of the ethical principles in general or in application of knowledge, results of research, or creative expression. (10a)
8. Demonstrate the significance of time management in group work. (11b)
9. Ability to use google scholar to obtain peer-reviewed journal articles and books. (12a)

NOTE: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).

Course Organization
1.0 hours of lecture per week for 13 weeks
2.0 hours of lab/tutorial per week for 12 weeks

Teaching Assistants
TBA
**Course Evaluation**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Participation</td>
<td>40%</td>
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<tr>
<td>Final Project (Proposal)</td>
<td>5%</td>
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<tr>
<td>Final Project (Final Draft)</td>
<td>30%</td>
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<tr>
<td>Final Project (Oral Presentation)</td>
<td>25%</td>
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<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>100%</strong></td>
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**Note:** In order for a student to pass a course with "Theory and Laboratory" components, in addition to earning a minimum overall course mark of 50%, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the "Course Evaluation" section for details on the Theory and Laboratory components.

**Examinations**

No Exams.

**Other Evaluation Information**

Attendance is mandatory. The Participation grade, like the class, is an all-or-nothing component. If the student is found to be absent during any class or lab he/she will receive 0 for the participation grade. Note that BME100 is a pass-fail course. Students with a cumulative grade of 70% or more will be assigned a PSD (Pass) grade.

**Course Content**

<table>
<thead>
<tr>
<th>Week</th>
<th>Hours</th>
<th>Chapters / Section</th>
<th>Topic, description</th>
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<tbody>
<tr>
<td>1</td>
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<td>-</td>
<td>Introduction (Instructor Bio Course outline Project requirements and fundamental background)</td>
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<tr>
<td>2-3</td>
<td>2</td>
<td>-</td>
<td>Anatomy and Physiology</td>
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<td></td>
<td>- Introduction to human Anatomy and Physiology</td>
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<tr>
<td>4</td>
<td>1</td>
<td>-</td>
<td>Introduction to Biomechanics</td>
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<td></td>
<td></td>
<td>- Examples from Biomedical Engineering Projects</td>
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<tr>
<td>5-7</td>
<td>3</td>
<td>-</td>
<td>Biomaterials</td>
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<td>- Introduction to Biomaterials (metals polymers ceramics/bioglasses)</td>
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<td>- Clinical applications of Biomaterials</td>
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<td>- Bioglasses and polymers in Biomedical Engineering</td>
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<td>- Dental restorative materials</td>
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<tr>
<td>8</td>
<td>1</td>
<td>-</td>
<td>Bone Implants</td>
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<td>- Bone components and composition</td>
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<td>- Osteoporosis</td>
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<td>- Modifiable and unmodifiable determinants</td>
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<tr>
<td></td>
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<td>- Examples (knee surgery)</td>
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</table>
The Cardiovascular System
- Cardiac physiology
- Stents
- Laminar and turbulent flow
- Stent delivery device
- Heart valve repair

Biomedical Instrumentation
- Amplifiers
- Bio-signals and signal acquisition and averaging
- Biomedical devices

Medical Imaging
- Introduction to Radiation Imaging
- Computerized Tomography
- Magnetic Resonance Imaging

Rehabilitation
- Introduction to Rehabilitation
- Rehabilitation following spinal cord injury

Laboratory/Tutorials/Activity Schedule

<table>
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<tr>
<th>Week</th>
<th>Lab</th>
<th>Description</th>
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| 1-2  | How to conduct a literature review | - Introduction to literature review  
- Instructions on how to complete the project report  
- Q&A session |
| 3-10 | In-class project discussion | - Finalize the groups  
- Brainstorm for the proposal idea  
- Group work to complete the project |
| 11-12| Project presentation    | Lab: Each group must present the findings of their project in class (power point). |

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. 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](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/relobservforminstr.pdf](http://www.ryerson.ca/senate/forms/relobservforminstr.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 (AAS - [www.ryerson.ca/studentlearningsupport/academic-accommodation-support](https://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.

Suspicions 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 an 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) and to the Academic Integrity Office website ([https://www.ryerson.ca/academicintegrity/](https://www.ryerson.ca/academicintegrity/)).

**Important Resources Available at Ryerson**

1. [The Library](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](https://library.ryerson.ca/guides/workshops)
2. [Student Learning Support](https://www.ryerson.ca/studentlearningsupport) offers group-based and individual help with writing, math, study skills and transition support, and other issues.