



## BME-701: Biomedical Engineering Core I

### COURSE DESCRIPTION

An introduction to biomedical engineering. The biological, chemical, electrical, and mechanical principles involved in the design and operation of medical devices and bioprocesses. The engineering research themes of the School of Biomedical Engineering are emphasized: mechanical engineering, biomedical imaging, bioinstrumentation, biomedical technology (e.g. biophotonics and medical robotics) and neurotechnology.

### SCHEDULE

**Lectures:** Tuesdays (Starting from September 7<sup>th</sup>), 02:00-5:00pm  
Online (Microsoft teams)

### INSTRUCTOR

<b>Dr. Greg Wohl</b>	ETB 411, ext. 21195 <a href="mailto:wohlg@mcmaster.ca">wohlg@mcmaster.ca</a>
<b>Dr. Katherine Zukotynski</b>	<a href="mailto:zukotynk@mcmaster.ca">zukotynk@mcmaster.ca</a>
<b>Dr Tom Doyle</b>	ETB 106, ext.26139 <a href="mailto:doylet@mcmaster.ca">doylet@mcmaster.ca</a>
<b>Dr. Allison Yeh</b>	<a href="mailto:yehsc@mcmaster.ca">yehsc@mcmaster.ca</a>
<b>Dr. Jeff Fortuna</b>	(ETB 211, ext.20165) <a href="mailto:fortunjj@mcmaster.ca">fortunjj@mcmaster.ca</a>
<b>Dr. Boyang Zhang</b>	(JHE-A215, ext.24926) <a href="mailto:zhangb97@mcmaster.ca">zhangb97@mcmaster.ca</a>

Course TA: Vinay Patel ([patelv77@mcmaster.ca](mailto:patelv77@mcmaster.ca) )

### COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

Emails or <http://avenue.mcmaster.ca/>

## **BME-701 Outline: Fall. 2021**

### **ASSUMED KNOWLEDGE**

No prerequisite

### **COURSE MATERIALS**

All course material will be regularly posted to the Avenue to Learn site. It is the student's responsibility to check regularly for updates.

### **COURSE OVERVIEW**

<b>Date/Week</b>	<b>TOPIC</b>
<b>Week 1, 2 &amp; 3 (Sept. 7, 14 &amp; 21)</b> <b>Dr Thomas Doyle</b>	Biomedical instrumentation
<b>Week 4 &amp; 5 (Sept 28 &amp; Oct 5)</b> <b>Dr Greg Wohl (2:30 to 5:30 pm)</b>	Biomechanics
<b>Week 6 (Oct 12)</b>	<b>Reading week (No class)</b>
<b>Week 7 &amp; 8 (Oct 19 &amp; 26)</b> <b>Dr Allison Yeh</b>	Biomedical Optics
<b>Week 9 &amp; 10 (Nov 2 &amp; 9)</b> <b>Dr Jeff Fortuna</b>	Machine learning
<b>Week 11 &amp; 12 (Nov 16 &amp; 23) (Wed)</b> <b>Dr Boyang Zhang</b>	Microfluidics (Organ-on-chip)
<b>Week 13 &amp; 14 (TBD)</b> <b>Dr Katherine Zukotynski</b>	Medical Imaging
<b>To be announced</b>	Final Presentations

### ***Contingencies:***

*The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.*

**ASSESSMENT**

**Course Evaluation**

Section Evaluations (e.g., quiz, assignment, paper) **[60 %]**

- one evaluation per segment, to be assigned by the instructor
- each evaluation is worth 10%

Final Project **[40 %]**

Oral PowerPoint presentation (13-15 min) followed by Q and A session (5 min)

**FINAL PRESENTATIONS**

For the final evaluation of the course, you have to prepare a 13-15 minutes (+ 5 minutes for discussion) presentation about a self-chosen topic related to the field of Biomedical Engineering. This topic must be COMPLETELY OUT of your research area and the format of the presentation is also free, however you must answer the following questions.

1. What is the health problem (disease) related to the topic? (You must give an overview of the anatomy/physiology/biology of the problem including updated statistical information about morbidity/mortality)
2. Where within the field of BME does my topic fit?
3. How does my topic address the health problem?
4. What are the engineering principles behind the topic/device/method?
5. What alternatives to my topic/device/method exist to address the problem?
6. What are the advantages/disadvantages of my topic/device/method compared to the others?

**IMPORTANT NOTES:**

- 1). Your topic topic/device/method can be commercially available or “on-going” research. In any case it must be approved by the TA of the course.
- 2). To avoid repeated topics, a “first come, first served” scheme will be used so the suggestion is that you choose your topic as soon as possible.

In case you have any additional questions please email the TA.

**LEARNING OUTCOMES**

The Ontario Universities Council on Quality Assurance lists a set of graduate degree level expectations, 6 each for both Master’s and PhD programs (<https://oucqa.ca/framework/appendix-1/>). The alignment of graduate courses, within the School of Biomedical Engineering, with the program level learning outcomes of the Ontario Graduate Degree Level Expectations (GDLEs) that are assessed in BME-765 are summarized below.

<b>Ontario Graduate Degree Level Expectation (GDLE)</b>	<b>How Success in Obtaining the Attribute is Demonstrated</b>	<b>How is the GDLE is Assessed in BME-701</b>
1. Depth and breadth of knowledge	A systematic understanding of knowledge, including, where appropriate, relevant knowledge outside the field and/or discipline, and a critical awareness of current problems and/or new insights, much of which are at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice.	Section assignments and evaluated by the professors and the TA
2a. Research and Scholarship	A conceptual understanding and methodological competence that enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline;	Section assignments and presentations
2b. Research and Scholarship	A conceptual understanding and methodological competence that enables a critical evaluation of current research and advanced research and scholarship in the discipline or area of professional competence.	Section assignments and final presentation covering the relevant biomedical engineering topics
3. Level of application of knowledge	Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.	Section assignments & Final presentations
5. Level of communications skills	The ability to communicate ideas, issues and conclusions clearly.	Class discussions & Final presentations

**ACADEMIC INTEGRITY**

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. a grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <http://www.mcmaster.ca/academicintegrity>

The following illustrates only three forms of academic dishonesty:

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1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

### **ACADEMIC ACCOMMODATIONS**

Students who require academic accommodation must contact Student accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contact by phone at 905.525.9140 ext. 28652 or e-mail at [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information, consult McMaster University's Policy: [Academic Accommodation of Students with Disabilities](#).

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to the Engineering Student Services office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations.

Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

### **STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK**

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

### **EXTREME CIRCUMSTANCES**

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

### **AUTHENTICITY / PLAGIARISM DETECTION**

In this course we will be using a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. Students will be expected to submit their work electronically via Avenue to Learn (A2L) plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish to submit their work through A2L must still submit an electronic and/or hardcopy to the instructor. No penalty will be assigned to a student who does not submit work to A2L. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). To see the Turnitin.com Policy, please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity) .

**ONLINE ACCESS OR WORK**

In this course we will be using Avenue to Learn. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

**REFERENCE TO RESEARCH ETHICS**

The two principles underlying integrity in research in a university setting are these: a researcher must be honest in proposing, seeking support for, conducting, and reporting research; a researcher must respect the rights of others in these activities. Any departure from these principles will diminish the integrity of the research enterprise. This policy applies to all those conducting research at or under the aegis of McMaster University. It is incumbent upon all members of the university community to practice and to promote ethical behaviour. To see the Policy on Research Ethics at McMaster University, please go to <http://www.mcmaster.ca/policy/faculty/Conduct/ResearchEthicsPolicy.pdf>.