Course Syllabus

Western University

School of Biomedical Engineering

BME 3201A- “Fundamentals of Biomedical Engineering Design”

COURSE OUTLINE – Fall 2020

**CALENDAR DESCRIPTION:**
The objective of this course is to develop design skills and tools used in Biomedical Engineering. Integration of the engineering and life sciences will be illustrated by presenting design principles for medical devices and systems. Emphasis will be placed on engineering design for the rehabilitation and musculoskeletal systems.

**COURSE INFORMATION:**
Instructor: Prof. Emily Lalone
Room: TEB 361
Email: emily.lalone@uwo.ca
Lectures: Tues (6:30-9:30 pm)

Teaching Assistant: Elizabeth Norman, enorman4@uwo.ca

**PREREQUISITES:**
Engineering program must have completed the entire first year program in Engineering, with no outstanding credits to be taken, and have a Year Weighted Average (YWA) of at least 80% and permission of the School of Biomedical Engineering.

**ACCREDITATION UNITS:**
20% Engineering Science, 80% Engineering Design.

**TOPICS:**
Introduction into BME design of devices, systems and processes. An overview of fundamental design tools and product definition will be covered. Human factors such as anthropometric design, hardware software elements in human factors will also be covered. Biomaterials and materials testing and the design of devices and systems in this field will be overviewed. This course will also cover regulatory standards related to medical devices as part of Health Canada and the FDA. Engineering design of cardiovascular and musculoskeletal systems will also be covered along with an overview of relevant anatomy and physiology. It is understood that this is an entry level course in the area of biomedical engineering which focuses on the design process related to biomedical engineering devices, systems processes.

**COURSE OBJECTIVES:**
Upon successful completion of this course, students will develop skills necessary for biomedical engineering design and will be able to apply these skills to analyze and solve biomedical engineering design problems.

**REQUIRED ATTRIBUTES IN THE ENGINEERING PROFESSION:**

1. **Problem Analysis:** An ability to use appropriate engineering and life sciences (anatomy/physiology) knowledge and skills to identify, formulate, analyze and solve complex engineering problems.
2. **Design**: An ability to design solutions for complex, open-ended biological engineering problems and design systems, components or processes that meet specified needs with appropriate attention to regulatory and standards related to Health Canada and the FDA.

3. **Group work**: An ability to design devices, processes and components that are related to biological (anatomy, physiology) based problems. This will require students to work in a very multidisciplinary environment and so proficiencies in both the engineering and biological life sciences will be required.

4. **Ethics and Equity**: As biomedical design is design of devices, processes or systems that will be used with living creatures, regulatory considerations will be paramount to ensure safety. An ability to apply professional ethics, accountability and equity.

---

**SPECIFIC LEARNING OBJECTIVES:**

1. Biomedical Engineering Design (Design of Biomedical Devices and Systems)
2. Essentials of Engineering Design Processes for BME: EMPATHIZE
3. Essentials of Engineering Design Processes for BME: DEFINE
4. Critical Design Concepts for BME
5. Essentials of Engineering Design Processes for BME: Design of Musculoskeletal Systems
7. Essentials of Engineering Design Processes for BME: IDEATE
8. Essentials of Engineering Design Processes for BME: PROTOTYPE

---

**TEXT:**

There is no required textbook for this course, however suggested texts are as follows: *Biomedical Engineering and Design Handbook (Volume 1&2)* (M. Kutz) and *Design of Biomedical Engineering Devices and Systems* (P. King) and *Introduction to Rehabilitation Engineering* (Cooper).

---

**ONLINE CLASS DEMEANOR/NETIQUETTE**

Some components of this course will involve online interactions. To ensure the best experience for both yourself and your classmates, please abide the following rules:

- All live sessions will take place via Zoom meetings. The links to be accessed for each will be posted in sign-up session.

- You will be required to authenticate in the Zoom meeting with your Western credential (SSO authentication on the westernuniversity.zoom.us domain). In the event you attempt to authenticate in the Zoom meeting with different credentials, you will be removed from the online session without any warning.

- Please ensure that your Zoom participant name matches the one from the official roster. Failure to do so will mean that you will be removed from the online session without any warning.

- Please connect to the Zoom sessions on time.

- Please use a Windows or Mac computer to connect to the Zoom meeting as opposed to a mobile device (*i.e.*, cell phone or tablet).

- Please ensure that you are in a private location to protect the confidentiality of the discussions (if applicable).

- To minimize the background noise, please mute your microphone for the duration of class.
Please unmute your microphone only if invited to speak. Failure to do so might result in immediate removal from the meeting.

Please do not share your screen during the meeting unless asked by the instructor.

The course instructor will act as a moderator of the online live session and will attempt to answer the questions received from Zoom meeting participants. In this regard, please consider the following:

- If you wish to speak during the live meeting, please use the “raise hand” feature and wait for the instructor to nominate you to speak.
- Zoom keeps track of the order in which the “raise hand” feature was activated by each participant. Meeting participants will be asked to speak in the Zoom indicated order.
- Please remember to unmute your microphone and turn on your video camera (if turned off) before speaking.
- Please self-identify yourself at the beginning of your comment.
- Please remember to mute your microphone after speaking (unless directed otherwise).
- Please put down your “virtual hand” after speaking.

Some general considerations pertaining to “netiquette”:

- Please be mindful of the possibly different cultural and linguistic background of meeting participants.
- Be courteous with all Zoom meeting participants.
- Be respectful of the diversity of viewpoints that you will encounter in the class since the exchange of diverse ideas and opinions is an essential component of the academic environment. However, please keep in mind that practices such as “flaming” are unacceptable behavior.
- Be professional in all online postings and questions.
- Please note that disruptive behavior of any type to occur during online classes (including inappropriate use of the chat function) is unacceptable.
- Students found guilty of Zoom-bombing a class or of other serious online offenses are subject to disciplinary measures covered by the Code of Student Conduct.

**DESIGN PROJECT:**
Further details will be provided.

**EXAMINATIONS**
1. 1 hour closed book oral final exam period Dec 2020, with the instructor (zoom)
2. 1 hour closed book written final exam during the exam period Dec 2020 (proctortrack)

**UNITS:**
S.I. units will be used.
EVALUATION: The final grade is computed as follows:

Design Project: (Team and Topic), Design notebook: 5%, Recognition of Need: 5%, Project Proposal: 5%, SOTA, 10%, Concept Generation Map: 5%, Peer assessment of status report: 5%, Final Poster: 10%, Final Write up: 10%

Course Participation: 5%

Online Quizzes: 5%

Final Exam (All topics (including design project)): 35% (15% oral (zoom) + 20% written (proctortrack))

Tests and examinations in this course will be conducted using both Zoom and the remote proctoring service, Proctortrack.

When Zoom is used for exam invigilation, you will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session using Zoom will not be recorded.*

Proctortrack will require you to provide personal information (including some biometric data). The session will be recorded. By taking this course, you are consenting to the use of this software. More information about remote proctoring is available in the Online Proctoring Guidelines at the following link:

https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf

Completion of this course will require you to have a reliable internet connection and a device that meets the system and technical requirements for both Zoom and Proctortrack. Information about the system and technical requirements are available at the following links:

https://www.proctortrack.com/tech-requirements/.

https://support.zoom.us/hc/en-us.

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please discuss this with your instructor in advance of the test or examination.

ENGLISH: In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests and examinations for the improper use of English. Additionally, poorly written work with the exception of final examinations may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

ATTENDANCE: Design notebooks (5%) will be marked weekly and therefore attendance will be monitored. Please email the instructor/TA if you are absent. Any student who, in the opinion of the instructor, is absent too frequently from class in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.

CHEATING: University policy states that cheating, including plagiarism, is a scholastic offense. The commission of a scholastic offence is attended by academic penalties which might include expulsion from the program. If you are caught cheating, there will be no second warning. (see Scholastic Offence Policy in the Western Academic Calendar).

SSD: Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.
NOTE: The above topics and outline are subject to adjustments and changes as needed. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted for grading by the student in subsequent years.

Updated: August 24, 2020