Description: Biomedical engineering is a broad field of study, which involves applying the concepts, knowledge, and approaches of engineering to solve health care related problems. The objective of this course is to develop design skills and tools used in biomedical engineering design. An integration of the engineering and life sciences will be covered through the presentation of design principles for medical devices and systems.

Instructor: Dr. Emily Lalone PhD  
TEB 361, 519-661-2111 ext. 88242 emily.lalone@uwo.ca  
Office hours: TBD

Contact Hours: 3 lecture hours, 0.5 course. https://draftmyschedule.uwo.ca

Antirequisite(s): MME 4470A/B.

Prerequisites: Students 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 75%, as well as permission from the School of Biomedical Engineering, or be granted preadmission into the BME program.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

CEAB Academic Units: Engineering Science 20%, Engineering Design 80%.

Required Textbook:

There is no required textbook for this course; however, the suggested text is as follows:


Required Software: Students are encouraged to use MATLAB, SolidWorks, or any other modelling or simulation software that they wish to use to validate their designs.

Recommended References: If applicable, other recommended readings will be made available through OWL.
General Learning Objectives (CEAB Graduate Attributes)

<table>
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<tr>
<th>Knowledge Base</th>
<th>D</th>
<th>Use of Engineering Tools</th>
<th>D</th>
<th>Impact on Society and the Environment</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Analysis</td>
<td>D</td>
<td>Individual and Team Work</td>
<td>A</td>
<td>Ethics and Equity</td>
<td>I</td>
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<tr>
<td>Investigation</td>
<td>D</td>
<td>Communication Skills</td>
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<td>Economics and Project Management</td>
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<td>Design</td>
<td>A</td>
<td>Professionalism</td>
<td>A</td>
<td>Life-Long Learning</td>
<td>I</td>
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</table>

Notation: $x$ represents the content level code as defined by the CEAB. blank = not applicable; $I =$ introduced (introductory); $D =$ developed (intermediate) and $A =$ applied (advanced).

General Learning Objective:

*At the end of this course, students will be expected to apply the biomedical engineering design process to solve a specific clinically driven problem.*

Topics and Specific Learning Objectives

1- Biomedical requirements and specifications

   At the end of this section, students will be able to:
   
a. Define design requirements by assessing the needs of clinical partners.
b. Create specifications based on customer needs and prioritize design features.
c. Investigate the state of the art and critically analyze existing solutions.

2- Biomedical design concepts

   At the end of this section, students will be able to:
   
a. Consolidate specifications and perform a brainstorming session to ideate possible solutions.
b. Create and sketch design solutions and investigate their advantages and disadvantages in a biomedical application.

3- Evaluation of biomedical designs

   At the end of this section, students will be able to:
   
a. Perform a complete design of the device, system, or process and evaluate it via simulation and prototyping.

4- Assessment and approval of biomedical products

   At the end of this section, students will be able to:
   
a. Design an experiment to evaluate the performance of a biomedical product.
b. Describe the steps needed to implement the product as a real solution in the BME field (e.g., ethics approval, Health Canada approval).

Evaluation

<table>
<thead>
<tr>
<th>Course Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Class Attendance</td>
<td>11%</td>
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<tr>
<td>Design Project</td>
<td>50%</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>24%</td>
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</tbody>
</table>

**Class Attendance:** Students are expected to attend all class sessions and actively participate for the duration of the class. Each week will count for a 1% of the final grade, for up to 11 weeks of attendance. This means that students may miss a lesson without the need to explicitly request accommodation. Students attending all 12 weeks will receive a bonus 1% mark.

**Design Project:** A design project will be completed in teams (see Project tab on OWL for further details). The material will be submitted in 5 different steps, as follows:

- **Step 1** (5%) Will consist of a preliminary report the outlines the team and the project. This report will include the biomedical motivation, objectives, planned methods, materials required, and timeline for project development. Deadline: September 22, 2023
- **Step 2** (10%) Will consist of a report that summarizes the information that has been gathered, will expand on the biomedical need, and will explain how the specifications were developed. Deadline: October 6th, 2023
- **Step 3** (10%) Will consist of a report that outlines the process for concept generation and the possible concepts considered. Deadline: October 27th, 2023
- **Step 4** (10%) Will consist of a report that explains how the design concept was selected and details the conceptual design. Deadline: November 17th, 2023
- **Step 5** (15%) Will consist of a report on the complete design. This report can include the previous reports, which can be updated according to the feedback received. It must also outline the final product and its evaluation. Teams must also clearly explain how the design meets the biomedical requirements, and the limitations of the current prototype. Deadline: December 1st, 2023

**Oral Presentation:** The team will present their design as a 10 minute sales pitch to the customer. This presentation will take place on December 6th, 2022. Further instructions will be provided on OWL.

**Quizzes:** A total of seven quizzes will take place at the end of class on the dates indicated below. These tests will be closed book. Each quiz will count for 4% of the final grade. The grade for the 6 highest marks will be considered towards the final grade.

If a student misses a quiz, it will not be rescheduled regardless of the circumstances for which the quiz was missed. The student must first request accommodation from Undergraduate Services, and then contact the instructor. The instructor will decide whether to allow the reweighting of the quiz, where reweighting means that the marks normally allotted for the quiz will be added to a different component of the course. If no reasonable justification for missing the quiz can be found, then the student will receive a mark of zero for the quiz.

**Tentative quiz dates:**
- September 20th, 2023
- September 27th, 2023
- October 4th, 2023
- October 18th, 2023
- November 8th, 2023
- November 22nd, 2023
November 29th, 2023

**Online Activities:** Lecture material will be posted on OWL prior to each scheduled lecture. Project reports will be submitted online in the assignments page.

**How to succeed in this course:** Adhere to the week-to-week requirements as outlined in each unit. While every student works at a different level, it is the effort placed in each requirement that ultimately leads to success. Your interest in the course, participation in the course by asking relevant questions, and communicating with the instructor, will all contribute to your successful completion of project and quizzes. Note that it is your responsibility to determine what is required of you. Read through the online materials, course outline, and emails from the instructor, to determine the instructions regarding course deliverables.

**Use of 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 improper use of English. Additionally, poorly written work, with the exception of the final examination, 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:** All classes are mandatory, health permitting. Any student who, in the opinion of the instructor, is absent too frequently from class periods will be reported to the Dean (after due warning has been given). On the recommendation of the department, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

**Absence Due to Illness or Other Circumstances:** Students should immediately consult with the instructor or School Director if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see the attached “Instructions for Students Unable to Write Tests or Examinations or Submit Assignments as Scheduled”). The student should seek advice from the instructor or School Director regarding how best to deal with the problem. Failure to notify the instructor or School Director immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

For more information concerning accommodations for religious holidays, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

**Cheating and Plagiarism:** Students must write their reports and quizzes in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. 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.

All required papers may be subject to submission for textual similarity review to commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

**Use of Electronic Devices:** Electronic devices are allowed during all sessions, except while quizzes are being completed. Other than the necessary devices needed to read the question and submit the responses, no other electronic devices may be used during quizzes.

**Policy on Repeating All Components of a Course:** Students who are required to repeat an Engineering course must repeat all components of the course. No special permissions will be granted enabling a student to retain any marks from previous years. Previously completed project reports and quizzes cannot be resubmitted by the student for grading in subsequent years.

**Internet and Electronic Mail:** Students are responsible for regularly checking their Western e-mail and the course web site (https://owl.uwo.ca/portal/) and making themselves aware of any information that is posted about the course. If the student fails to act on information that has been posted on these sites and does so without a legitimate explanation (i.e., those covered under the illness/compassionate form), then there are NO grounds for an appeal.

**Accessibility:** 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 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

**Support Services:**

- Student Development Centre, http://www.sdc.uwo.ca/
- Engineering Undergraduate Services, http://www.eng.uwo.ca/undergraduate/
- USC Student Support Services, http://westernusc.ca/services/

Students who are in emotional/mental distress should refer to Mental Health @ Western, http://www.health.uwo.ca/mental_health/, for a complete list of options about how to obtain help.
STATEMENT ON GENDER-BASED AND SEXUAL VIOLENCE

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, here. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

If, on medical or compassionate grounds, you are unable to write term tests or final examinations or complete course work by the due date, you should follow the instructions listed below. You should understand that academic relief will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services Office) that there are compelling medical or compassionate grounds that can be documented before academic relief will be considered. Different regulations apply to term tests, final examinations and late assignments. Please read the instructions carefully.

A. GENERAL REGULATIONS & PROCEDURES

1. All first-year students will report to the Undergraduate Services Office by submitting the Academic Consideration Request Form, for all instances.

2. If you are an upper year student and you are missing a test/assignment/lab or examination you will report the absence by submitting Academic Consideration Request Form. Absences worth LESS THAN 10% of your mark, will be processed by your department office. If your course work is worth 10% OR MORE of your final grade, your request will be processed by the Undergraduate Services Office.

3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.

4. Documentation must be provided as soon as possible. If no one is available in your department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.

5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. TERM/MIDTERM TESTS

1. If you are in first year and you are unable to write a midterm/term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.

2. If you are an upper year student and you are unable to write a midterm/term test, inform your instructor PRIOR to the scheduled date of the test and request relief through the Academic Consideration Request Form. If the instructor is not available, leave a message for him/her at the department office. If the test is worth LESS THAN 10% of your mark, your request for relief will be processed by your department office.
If the test is worth MORE THAN 10% of your final grade your request for relief will be processed by the Undergraduate Services Office.

3. Be prepared to attach supporting documentation to the Department Chair and/or the Undergraduate Services Office through the online form (see next page for information on documentation).

4. Discuss with the instructor if and when the test can be rescheduled. The approval of the Chair or the Undergraduate Services Office is required when rescheduling midterm/term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to report your absence using the Academic Consideration Request Form and request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.

2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.

3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department and the Associate Dean and in order to apply you must submit an “Application for a Special Exam” form. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

PLEASE NOTE: It is the student’s responsibility to check the date, time and location of the Special Examination.

D. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (prior to the due date of the assignment).

2. Be prepared to submit the Academic Consideration Request Form and provide documentation if requested by the instructor (see reverse side for information on documentation).

3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.

4. i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.

   ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean, Undergraduate Studies.

E. SHORT ABSENCES

If you miss a class due to a minor illness or other problem, check your course outlines for information regarding attendance requirements and make sure you are not missing a test, laboratory or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You are strongly encouraged to seek advice from your Academic Counsellor in the Undergraduate Services Office.
G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, you must provide the doctor with a Student Medical Certificate to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor’s notes will not be accepted; only the Student Medical Certificate will be accepted.

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member’s physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director’s office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. ACADEMIC CONCERNS

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).

2. You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.

3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your Academic Counsellor.

Calendar References: Check these regulations in your 2023 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness: https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_135

Academic Accommodations for Students with Disabilities: http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_10

Academic Accommodations for Religious or Holy Days: http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_16

Course Withdrawals: http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=6&SelectedCalendar=Live&ArchiveID=#Page_75

Examinations: http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=5&command=showCategory&SelectedCalendar=Live&ArchiveID=

Scheduling of Term Assignments:
Scholastic Offences:

Student Medical Certificate:

Engineering Academic Regulations:

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Add Deadlines:  First term half course (i.e. “A” or “F”)

<table>
<thead>
<tr>
<th></th>
<th>September 15, 2023</th>
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<tbody>
<tr>
<td>Full courses and full-year half course (i.e. “E”, “Y” or no suffix)</td>
<td>September 15, 2023</td>
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<tr>
<td>Second term half course (i.e. “B” or “G”)</td>
<td>January 16, 2023</td>
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Drop Deadlines:  First term half course without penalty (i.e. “A” or “F”)

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<tr>
<th></th>
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<td>Full courses and full-year half courses without penalty (i.e. “E”, “Y” or no suffix)</td>
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<tr>
<td>Second term half or second term full course without penalty (i.e. “B” or “G”)</td>
<td>March 7, 2023</td>
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Contact Information:

Undergraduate Services Office:  SEB 2097  Phone: 519-661-2130  E-mail:
engugrad@uwo.ca

Chemical & Green Process Engineering:  TEB 477  Phone: 519-661-2131  E-mail:
cbeugrad@uwo.ca

Civil Engineering:  SEB 3005  Phone: 519-661-2139  E-mail:
civil@uwo.ca

Computer, Electrical, Mechatronic Systems & Software Engineering:  TEB 279  Phone: 519-661-3758  E-mail:
ceceugrad@uwo.ca

Integrated Engineering:  ACEB 2410 Phone: 519-661-6725  E-mail:
engceli@uwo.ca

Mechanical Engineering:  SEB 3002  Phone: 519-661-4122  E-mail:
mmeundergraduate@uwo.ca

Revised 06/25/2023