



Course Outline

Instruction Team

- Dr. Jason Morrison, P.Eng. (he/him)
E1-356 EITC
(204) 474-8496
Jason.Morrison@umanitoba.ca

Student Hours

- Thursdays 3:00 – 4:00 PM
- Individual assistance is always available by appointment talk to me.

Teaching Assistant

- Bailey Paziuk
paziukb@myumanitoba.ca

Location

- **E2-351 EITC Bldg (Lectures)**
Mon, Wed, Fri 9:30 - 10:20 AM
- **Agriculture 137 (Studio)**
Mon 2:30-5:30 PM

Contact Hours

- 3 credit hours
- Lectures:
3 hours x 12 weeks = 36 hours
- Studio Time:
3 hours x 12 weeks = 36 hours

Prerequisites:

- BIOL 1410, BIOL 1400 & BIOE 3320

Course Website:

<http://umanitoba.ca/umlearn>

BIOE 4640 Bioengineering Applications in Medicine Fall 2022

Course Objectives

To provide the fundamental knowledge and skills required by a bioengineer to begin working in a medically related field and be capable of the necessary day-to-day collaborations with professionals in medicine and engineering.

Course Content

1. Introduction to engineering in medicine, clinical engineering and basic regulations for medical devices;
2. Design, principles, and properties of biomedical sensors and biosensors
3. Biocompatibility, mechanics, wear and biological effects of biomaterials;
4. Principles of and design in radiology, x-ray, CT and MRI imaging modalities

Course Delivery

Lectures and Studio Time will proceed as listed in the left and this time will be used to deliver course content, provide time for design work, testing and presentations.

Considering the ongoing pandemic please note:

The Department of Biosystems Engineering has devised a plan so that there is minimal impact on the delivery and content of the course, should the instructor fall sick and is unable to continue lectures in-person. Please be assured that the alternative plan outlining any deviation from the normal mode of instruction will be communicated to you as quickly as possible if/when the need arises.

Recommended Reading

Enderle J, Blanchard S, Bronzino J. ed. *Introduction to Biomedical Engineering* 3rd ed., Academic Press, 2012.

Anon. Ed. *Encyclopedia of Biomaterials and Biomedical Engineering*. Marcel Dekker, 2006

Bronzino, J. D. Ed. *Tissue Engineering and Artificial Organs*, CRC Press, 2006.

David, Y., W. W. von Maltzahn, M. R. Neuman, and J. D. Bronzino, Eds.. *Clinical Engineering*, CRC Press, 2003.

Mudry, K. M., R. Plonsey, and J. D. Bronzino, Eds.. *Biomedical Imaging*, CRC Press, 2003.

The Instructor will supply additional Materials through the course website.

Traditional Territories Acknowledgement

The University of Manitoba campuses are located on the original lands of the Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

Accreditation Details

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 50%
- Engineering Design: 50%

Graduate Attributes

KB: A knowledge base for engineering
 PA: Problem analysis
 IN: Investigation
 DE: Design
 ET: Use of engineering tools
 IT: Individual and team-work
 CS: Communication skills
 PR: Professionalism
 IE: Impact of engineering on society/environment
 EE: Ethics and equity
 EP: Economics and project management
 LL: Life-long learning

Competency Levels

- 1 - Knowledge (Able to recall information)
- 2 - Comprehension (Ability to rephrase information)
- 3 - Application (Ability to apply knowledge in a new situation)
- 4 - Analysis (Able to break problem into its components and establish relationships.)
- 5 - Synthesis (Able to combine separate elements into a whole)
- 6 - Evaluation (Able to judge the worth of something)

Learning Outcomes

By the end of this course, you will be able to:

No.	Learning Outcome	Graduate Attribute
1	Explain the fundamental knowledge required by a bioengineer to work in a medically related field.	Knowledge Base
2	Analyze x-ray, CT and MRI technology to determine the constraints of working with these modalities.	Problem Analysis
3	Learn regulatory mechanisms relevant to designing new medical devices.	Engineering Tools; Lifelong Learning
4	Design and evaluate biomedical equipment.	Project management; Design
5	Summarize the results of the design process in a formal report.	Design and Communication Skills
6	Apply learned material to novel situations of equipment design.	Design

Graduate Attribute Competency Levels Developed

Outcome	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	2											
2		4										
3					3							
4				5.6								
5							5					
6												3

CEAB Graduate Attributes Assessed

- DE.1 – Understands the complexities of an open-ended engineering design problem and defines appropriate objectives and constraints
- DE.3 – Develops possible solutions to an open-ended design problem, leading to an appropriate recommendation

Important Dates

- **Assignment Ia Due**
Mon Sept 19, 2022 5:30pm
- **Early Withdrawal Deadline**
September 20, 2022
- **National Day for Truth and Reconciliation**
September 30, 2022
No classes or examinations
- **Assignment Ib Due**
Wed Oct 5, 2022 12:30pm
- **Thanksgiving**
October 10, 2022
No classes or examinations
- **Midterm**
Mon. Oct 31, 2022
- **Fall Term Break**
November 7-10, 2022
No classes or examinations
- **Remembrance Day**
November 11, 2022
No classes or examinations
- **Assignment II Due**
Mon November 21, 2022
- **Voluntary Withdrawal Deadline**
November 22, 2022
- **Assignment III Due**
Mon December 5, 2022 2:30pm
- **Last Day of Classes**
December 12, 2022

Evaluation

Midterms and Quizzes missed for legitimate reasons will have that portion of the grade moved to the final exam. Late assignments are not accepted.

Component	Value (%)	Assessor	Method of Feedback*	Learning Outcomes Evaluated	I/T**
Final Exam	25	JM	S	1, 2, 3	I
Midterm	15	JM	S	1, 2, 3	I
Quizzes	10	BP	S	1, 2, 3	I
Assignment I	15	BP	S, F	4, 5, 6	T
Assignment II	15	BP	S, F	4, 5, 6	T
Assignment III	20	BP/JM	S, F	4, 5, 6	T
Peer Assessment	Applicable to Team Assignment Work				

* Method of Feedback: **F** - Formative (written comments / oral discussion), **S** - summative (numerical grade)

** I/T: **I** – Individual effort, **T** – A team effort

Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the *General Academic Regulations on Academic Integrity*, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g., suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

Requirements/Regulations

- Please copy the Instruction Team in all emails (Instructors and Teaching Assistants). All email communication must conform to the Communicating with Students university policy. [🔗 Communicating with Students](#)
- As the Instruction Team, we will do our best to respond to all emails **within 48 hours during working hours** (8:30 AM – 5:30 PM Monday thru Friday). Ex. A Friday night email may not be responded to until the following Tuesday.
- Self-declaration forms may be completed for missed tests, exams, or assignments during short-term absences (≤ 72 hours) for extenuating circumstances. This form cannot be used for planned absences like vacations. It is also not to be used for longer-term absences, or ongoing circumstances (e.g., Authorized Withdrawals, Leaves of Absence, or other accommodations), which will still require additional documentation. [🔗 Self-Declaration Form for Brief or Temporary Absence](#)
[🔗 Self-Declaration Policy for Brief or Temporary Absences](#)
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should familiarize themselves with the University's *General Academic Regulations*. [🔗 General Academic Regulations](#)
[🔗 Engineering Academic Regulations](#)
- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g., Academic Integrity, Respectful Behaviour, Examinations, and related matters. [🔗 Supplemental Resources](#)

Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the Instructor and the Department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University's *Intellectual Property Policy* and the protection of privacy provisions of *The Freedom of Information and Protection of Privacy Act (Manitoba)*. Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.

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 Copyright Office