



**University of Manitoba**  
**Department of Biosystem Engineering**

# **Course Syllabus**

**BIOE 4650**

**Textiles in Healthcare and Medical Applications**

**Academic Session: Winter 2023 (Jan. 9- Apr. 12, 2023)**

## COURSE DETAILS

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<b>Course Title &amp; Number:</b>	BIOE 4650: Textiles in Healthcare and Medical Applications
<b>Number of Credit Hours:</b>	4
<b>Class Times &amp; Days of Week:</b>	Class: M/W/F 11:30 am - 12:20 pm Tutorial: R 2:30 pm - 4:30 pm
<b>Location for classes/labs/tutorials:</b>	HUMAN ECOLOGY 300
<b>Pre-Requisites:</b>	N/A

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## Instructor Contact Information

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<b>Instructor(s) Name:</b>	Dr. Wen Zhong (Professor)
<b>Office Location:</b>	W579 Duff Roblin Bldg.
<b>Office Hours or Availability:</b>	By appointment (via email or phone)
<b>Office Phone No.</b>	(204)474-9913
<b>Email:</b>	<a href="mailto:Wen.Zhong@umanitoba.ca">Wen.Zhong@umanitoba.ca</a>
<b>Contact:</b>	Preferred contact method: email (24/7)
<b>Teaching Assistant(s):</b>	N/A
<b>Department Office location:</b>	E2-376 EITC Phone Number 474-6033

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## Course Description

This course is organized into two parts: The first part deals with the basics of what is involved in the area of healthcare and medical textiles, including textile materials and structures, nanofibers, textiles as a source of comfort and healthcare problems, and biocompatibility/ biostability issues. The second part focus on the application of textile products and constructions for healthcare and medical end uses, including protective and hygiene textiles, external devices, tissue engineering, and intelligent/smart textiles.

## General Course Information

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### Students' Learning Responsibilities

It is expected that students will be in attendance, and on time, for all scheduled lectures and labs. If you must be absent, please show the courtesy of sending an e-mail notifying me of your absence. To benefit the most from this class, you must be willing to participate in class discussions. Deadlines are a reality in the world of engineering; I expect assignments to be completed on time. Finally, please respect both us as instructors and your classmates by turning off your cell phone during class time. Laptops may be used during lectures only if you are taking notes on the laptop.

### Why this course is useful?

As an introduction to the interdisciplinary field of healthcare and medical textiles, the course introduces basics of fibers and textile structures that can be used in the healthcare sectors, and information on design and product development in medical and healthcare textiles. The students will learn to connect the basics of textile engineering and related concepts to the design and development of textile materials and structures for medical end uses.

### Who should take this course?

This course is one of the design electives available for students in the Biosystems Engineering program. This course is also for graduate students who are interested in the topic.

### How this course fits into the curriculum?

Design electives are typically taken by Biosystems Engineering students in either the third or fourth year of the program.

### Description of Projects and Examinations

**Research Project:** Your "Expert" Opinion (individual project)

- The students are expected to use the knowledge learnt from the lecture to match existing product to specific need.
- Description: The end users have demands for a certain type of healthcare and medical textile products/services. There are plenty of such products to choose from. Can you make a recommendation base on their need?
- Deliverables: A PowerPoint presentation and a written report

**Design Project:** a group project, 2-3 students for each group

- The students are expected to use the knowledge learnt from the lecture to envision a design plan to improve one or several aspects of an existing medical textile product.
- Description: Each group will select a healthcare or medical textile product from a list. Conduct a literature search to find out the background information, existing design or products available, problems of existing design/products, and propose/present your design plan.
- Deliverables: A proposal, A PowerPoint presentation and a written report for the final design.

**Group Work Policies:** You will be required to work in teams to complete some of the assignments for this course. This is done because you will often find yourself working in a team setting once you enter the workforce. It is in your best interest to learn how to work in a team setting.

A **midterm** examination will be scheduled in the 6th week of the course. The midterm examination will test the student's knowledge of the lecture material covered in the first part of the course.

A **final** examination will be scheduled at the end of the semester. The final examination will test the student's knowledge of the lecture material covered in the second part of the course.

## Course Goals

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The intent of this course is to:

- To introduce students to the basic principles and applications of textiles in the healthcare sector.
- To provide students with a basic knowledge of the performance requirements, methods of production, structure and properties of various medical/healthcare textile products.
- To introduce the criteria and procedures for designing medical/healthcare textile products.

## Intended Learning Outcomes

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At the conclusion of this course, the student should be able to:

1. Explain the basic principles associated with the use of textiles in the healthcare sectors.
2. Explain the various applications of textiles in the healthcare sector.
3. Research an application of textiles in the healthcare sector to identify consumer issues.
4. Analyze an existing medical textile product to identify potential design improvements.

## Using Copyrighted Material

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Please respect copyright. We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the *Copyright Act* applies or written permission has been confirmed. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright/> or contact [um\\_copyright@umanitoba.ca](mailto:um_copyright@umanitoba.ca).

## Recording Class Lectures

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Dr. Wen Zhong and the University of Manitoba hold copyright over the course materials, presentations and lectures which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part

without permission from Dr. Wen Zhong. Course materials (both paper and digital) are for the participant's private study and research.

## **Textbook, Readings, Materials**

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### **Textbook**

- Zhong W, An Introduction to Healthcare and Medical Textiles, DEStech Publications, 2012.

Supplementary readings – Any books on biomaterials, medical textiles.

### **Additional Materials**

PowerPoint presentations are available on the JUMP (the University of Manitoba portal and course tools) website. The address is <https://universityofmanitoba.desire2learn.com/d2l/login>. When you enter this page, you will find files containing the slides in the pdf format. The slide files are numbered and can cover several lectures. New slide files will be added to the website as the course progresses. Because the slides are saved in the pdf format as handouts, you cannot change their configuration. Also, you will receive project handouts via JUMP but they will be saved in separate folders named "projects".

## **Course Technology**

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It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. The student can use all technology in classroom setting only for educational purposes approved by instructor and/or the University of Manitoba Student Accessibility Services. Student should not participate in personal direct electronic messaging / posting activities (e-mail, texting, video or voice chat, wikis, blogs, social networking (e.g. Facebook) online and offline "gaming" during scheduled class time. If student is on call (emergency) the student should switch his/her cell phone on vibrate mode and leave the classroom before using it. (©S Kondrashov. Used with permission)

## **Class Communication**

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The University requires all students to activate an official University email account. For full details of the Electronic Communication with Students please visit:

[http://umanitoba.ca/admin/governance/media/Electronic Communication with Students Policy - 2014 06 05.pdf](http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf)

Please note that all communication between myself and you as a student must comply with the electronic communication with student policy

([http://umanitoba.ca/admin/governance/governing\\_documents/community/electronic\\_communication\\_with\\_students\\_policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)). You are required to obtain and use your U of M email account for all communication between yourself and the university.

## **Expectations: I Expect You To**

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We expect you to be in attendance, and on time, for all scheduled lectures and labs. If you must be absent, please show us the courtesy of sending an e-mail notifying us of your absence.

To benefit the most from this class, you must be willing to participate in class discussions. Therefore, you will be expected to prepare for class by reading the assigned materials.

### **Academic Integrity:**

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty. Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room. Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty. Students should acquaint themselves with the University's policy on plagiarism; cheating, exam impersonation, and duplicate submission (see the University of Manitoba Undergraduate Calendar for 2016).

## **Students Accessibility Services**

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### **Student Accessibility Services**

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

*Student Accessibility Services* <http://umanitoba.ca/student/saa/accessibility/>

520 University Centre

204 474 7423

[Student\\_accessibility@umanitoba.ca](mailto:student_accessibility@umanitoba.ca)

## **Expectations: You Can Expect Me To**

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### **Instructional Methods**

In this course, dissemination of information will occur using the traditional lecture format. Examples of problems will aid in understanding steps involved in a solution process. Students will take home weekly numerical problems as assignments that will be evaluated by a teaching assistant; will perform laboratory experiments, work with laboratory equipment, will prepare written lab reports that will be evaluated.

## Class Schedule

This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students. Changes are subject to Section 2.8 of the – [ROASS](#)- Procedure).

Topics	Lecture dates	No of lectures
1. Introduction	Jan 9, 11	2
<b>Basics</b>		
2. Textile materials and structures 2.1 Polymers 2.2 Fibers 2.3 Textile Structures 2.4 Finishes and modifications 2.5 3D printing	Jan 13, Jan 16 Jan 18 Jan 20 Jan 23	5
3. Nanofibers for medical uses	Jan 25, 27	2
4. Textiles: comfort and health problems	Jan 30, Feb 1, 3	3
5. Biocompatibility & biostability	Feb 6, 8, 10	2
Midterm review	Feb 13	1
Midterm Break Feb 16-19		
<b>Applications</b>		
6. Disposable hygiene textiles	Feb 15, 17, 20	3
7. Healthcare protective textiles	Feb 22, 24, 27	3
8. Textiles for wound care	Mar 1, 3, 6	3
9. Biotextiles: Sutures	Mar 8, 10, 13	3
Vascular Grafts	Mar 15, 17	2
Ligaments/mesh grafts	Mar 20, 22	2
Extracorporeal devices	Mar 24	1
10. Tissue Engineering	Mar 27, 29	2
11. Intelligent textiles	Mar 31, Apr 3, 5	3
Final Review	Apr 7, 10	2
Final Test	Apr 12	

### Important Dates

Feb 21 - 24, 2023 Mid Term Break  
 Feb 16, 2023 Midterm test  
 Mar 22, 2023 Voluntary Withdrawal Deadline  
 Apr 12, 2023 Final test

## Tutorial Schedule

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Topics	Tutorial dates
Choose topic for projects, NO MEETING	Jan 12
Work on research project, NO MEETING	Feb 19, 26
<b>Presentations for Research Project</b>	Feb 9
<b>Midterm Test</b>	Feb 16
Midterm Break Feb 21-24	
Choose topic for design project, NO MEETING	Mar 2
<b>Proposal for Design Project, NO MEETING</b>	Mar 9
Feedback on proposal, NO MEETING	Mar 16
Work on design project, NO MEETING	Mar 23
Proposal due	Mar 30
<b>Presentations for Design Project</b>	Apr 6

## Course Evaluation Methods

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### Grade Evaluation

The grade distribution is shown below:

1. Research project 25%
2. Design Project 35%
3. Midterm Test 20%
4. Final Test 20%

Final marks will be assigned as follows: A+ = 100 - 92%, A = 91.9 - 85%, B+ = 84.9 - 78%, B = 77.9 - 70%, C+ = 69.9 - 62%, C = 61.9 - 55%, D = 54.9 - 50%, F = below 50%

## Referencing Style

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BIOSYSTEMS ENGINEERING CITATION GUIDE – CSBE STYLE

Details to be posted on UM Learn.

## Assignment Extension and Late Submission Policy

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### Late Project Assignments

Penalties deducted for late assignments will be as follows: up to 1 week late -20%; 1 to 2 weeks late -40%; and over 2 weeks late -100%.

### Missed Project Assignments

Each missed assignment will be counted as 0%



**Missed Tests**

If a student misses a midterm test due to a justifiable or important reason, the percentage of the missed midterm test will be added towards the final test. For example, with a missed midterm, the final test will be valued at 40%.

If a final test is missed, a university policy for such cases is followed.