



Integrated Biomedical  
Engineering & Health  
Sciences Program

## IBEHS 3P04 Syllabus

Winter 2020

Health Solutions Design Projects III



## IBEHS 3P04: Health Solutions Design Projects III Winter 2020

### COURSE INSTRUCTORS

Dr. Janie Wilson, PhD  
janiewilson@mcmaster.ca

Office: MUMC 3V43A

Dr. Qiyin Fang, PhD, PEng (LEL)  
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Office: ETB 405

**COURSE EMAIL:** [ibio3p04@mcmaster.ca](mailto:ibio3p04@mcmaster.ca) (Please use this email for all course correspondence including communication with the instructors)

### INSTRUCTIONAL ASSISTANT AND TEACHING ASSISTANTS

Parmveer Bola  
bolap1@mcmaster.ca

Office: ETB 534A  
Office Hours: by appointment

**TEACHING ASSISTANTS (TAs):** (Each Design Studio Section will have one (1) of the following TA's)

Mondays: Ali Ammar; ammara@mcmaster.ca  
Wednesdays: Michael Zon; zonm@mcmaster.ca  
Fridays: Ian Phillips; phillih@mcmaster.ca

Tuesdays: Julian Jasionowski; jasionoj@mcmaster.ca  
Thursdays: Erynne Rowe; rowee3@mcmaster.ca

### LAB TECHNICIAN

Leela Pili  
pillil@mcmaster.ca

Office: ETB 534A  
Office Hours: drop-in or by appointment

### INSTRUCTIONAL COORDINATOR

Sinah Lee  
leesk2@mcmaster.ca

Office: MDCL 3300/A  
Office Hours: By appointment

## FACULTY MENTORS

Faculty mentors from the School of Rehabilitation Science and the Faculty of Engineering will join us in the Design Studio during certain weeks to provide additional mentorship and support.

### Weeks of Jan 20-31, School of Rehabilitation Science Mentors:

Mondays: Dr. Lisa Carlesso, carlesl@mcmaster.ca  
 Tuesdays: Dr. Marla Beauchamp, beaucm1@mcmaster.ca  
 Wednesdays: Dr. Renata Kirkwood, kirkwor@mcmaster.ca  
 Thursdays: Dr. Luciana Macedo, macedol@mcmaster.ca  
 Fridays: Dr. Dina Brooks, brookd8@mcmaster.ca

### Weeks of Feb 3-14, Faculty of Engineering Mentors

## COURSE DESCRIPTION

This course is the third course of the design and innovation sequence in the iBiomed program. Working in groups, problem solving skills are applied in the context of an open-ended design problem. Principles of engineering problem solving, systems analysis, simulation, optimization and design are applied to healthcare problems.

Specifically, 3P04 will focus on design solutions in the space of post-surgery biomechanical rehabilitation. Rehabilitation biomechanics is the field of study that focusses on the understanding the impact of disability and the effectiveness of rehabilitation therapies and interventions on human performance. Patients often require rehabilitation therapy after surgeries to restore or improve their biomechanics. This can include interventions to improve movement, balance, strength, muscle activation and coordination.

In 3P04, students will be presented with 5 common post-surgery rehabilitation challenges. Working within teams, students will choose one challenge and work through a 9-week project designing an effective solution to help rehabilitation caregivers and patients to restore biomechanics function after surgery.

Lectures will be used to provide students with content and context in the field of rehabilitation biomechanics, as well as electronics design, modeling and signal processing required to approach their design problems.

## COURSE SCHEMATIC



## TIMETABLE

(Note that a detailed weekly lecture and design studio timetable can be found in a separate pdf file on Avenue to Learn under 'Timetable'. We appreciate your patience and understanding if this schedule varies slightly throughout the term).

**LECTURES:** Tuesday 1:30 – 2:30 pm; Thursday 9:30 – 10:30 am.

**Lecture Location:** T13 Room 127

**DESIGN STUDIO (TUTORIALS):** 1 hour 50 minutes per week, 10:30 am – 12:20 pm

Refer to your assigned tutorial section for date and time.

**Design Studio Location:** ABB C104

## LEARNING OUTCOMES

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#### UPON SUCCESSFUL COMPLETION OF THE COURSE, THE STUDENT SHOULD BE ABLE TO:

<b>LO.01</b>	Apply engineering knowledge in designing a feasible solution to a health problem
<b>LO.02</b>	Identify appropriate use of methods and models to analyze a technical problem in the health care space.
<b>LO.03</b>	Work effectively in a team structure, managing time, prioritizing tasks and taking leadership when appropriate
<b>LO.04</b>	Communicate design process and decision-making in both written and oral formats and effectively respond to questioning
<b>LO.05</b>	Incorporate engineering economics principles in design decision-making
<b>LO.06</b>	Independently apply knowledge and skills, and seek out sources, to critically evaluate designs and make decisions

## SKILLS DEVELOPMENT

Throughout this course, you will demonstrate your deductive skills by solving one of the main challenges that revolve around orthopedic post-surgery rehabilitation.

The transferrable skills you will develop and strengthen include:

- Teamwork
- Collaboration
- Time Management
- Communication

The technical skills you will develop and strengthen include:

- Computing
- Data Acquisition and processing
- Prototyping
- Solid Modelling
- Visualization
- Economics and Financial Analysis

## **INCLUSIVE ENVIRONMENT STATEMENT**

We consider this classroom to be a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

We will gladly honour your request to address you by an alternate name or gender pronoun. Please advise us of this preference early in the semester.

## **MATERIALS AND FEES**

### **Required Texts**

'Engineering Economics: Financial Decision Making for Engineers' Sixth Edition. Editors; NM Fraser, EM Jewkes, M Pirnia. Pearson Canada Inc. 2017.

This same textbook will be used in IBEHS 4P04.

All additional course materials will be included within the customized Course Pack, available on the IBEHS 3P04 Avenue site.

### **Required Software and Materials**

Computers with Matlab (Mathworks) are available in all Engineering computer labs. Students are encouraged to have their own copy of Matlab for processing use in their design projects. Matlab is used in multiple courses throughout the iBioMed program and the student edition is available at the Campus bookstore.

### **Calculator**

Only the McMaster Standard Calculator will be permitted in tests and examinations.

### **Online Management**

The Course Management System will be Avenue to Learn (<http://avenue.mcmaster.ca/>). The student is expected to check this system daily.

## **COURSE OVERVIEW and ASSESSMENT**

### **Lecture and Design Studio Attendance**

Students should strive to attend all weekly lectures. New, relevant content will be provided in each lecture system that will be important for student preparation for examinations and tests, as well as in their design project process.

Students are assigned to specific Design Studio sections. Students must attend the day and time of the session they have been assigned.

### **Submission of Work**

It is the responsibility of the student to ensure that all assessments are correctly submitted on time to the correct location, and in the specific format. Failure to correctly submit an assignment will result in a mark deduction.

Grades for Design Project work will be posted to Avenue within 7 days after submission. You will have 7 days from this date to address any concerns you may have with the Course Instructors or your Instructional Assistant.

All milestones and assessments will be submitted through the Assessments tab in Avenue to Learn. Late uploads or files missing from submission will not be graded. Please use the following naming conventions for individual and team submissions respectively for milestones:

**FirstNameLastName\_M#\_OptionalDescription.pdf**

**Team#\_M#\_OptionalDescription.pdf**

### **Submission Penalties**

Design Project Milestones: Worksheets must be submitted by the deadline indicated or they will not be graded.

Learning Portfolio: All work submitted to your online Web Portfolio must be submitted by 11:59 pm EST on deadline day to be considered for grading.

General: It is your responsibility to ensure that any electronic submissions can be opened by the TA. Submissions that cannot be opened will not be graded. Any submissions deemed to be partially or fully copied will be considered an academic offence and be subject to terms laid out under the Academic Integrity Policy.

### **Assessments and Exams**

All cumulative assessments and exams must be written. Failure to write will result in a final grade of F with the notation DNW (Did Not Write). In a case where the component weight cannot be fulfilled as a result of an unforeseen and/or uncontrollable circumstance(s) in the course operation or execution, the grades assigned to that component may be pro-rated.

**ASSESSMENT DETAILS**

<b>Final Grade Component</b>	<b>Weight</b>
Project Zero	<b>2%</b>
Design Project*	<b>58%</b>
Milestone 1	3%
Milestone 2	2.5%
Milestone 3	2.5%
Milestone 4	5%
Milestone 5	5%
Milestone 6	5%
Milestone 7	5%
Milestone 8	5%
Milestone 9	5%
Final Report	10%
Final Expo Presentation	10%
Assignments	<b>10%</b>
Lecture content-based assignments	10%
Cumulative Assessments and Exams	<b>30%</b>
Mid-term Assessment 1 (Location MDCL 1110)	(7%)
Mid-term Assessment 2 (Location MDCL 1110)	(8%)
Final Exam	(15%)

\* A detailed breakdown for each Milestone can be found in the appropriate section in the Course Pack.

**IMPORTANT DATES**

January 6, 2020	Design Studios Begin
January 7, 2020	Lectures Begin
Jan 6 – Jan 17, 2020	Project Zero
January 20 – March 31, 2020	Design Project
Feb 17 – Feb 21, 2020	Reading Week
Feb 6, 2020	Mid-term Assessment 1
Mar 12, 2020	Mid-term Assessment 2
Mar 31-Apr3	Design Project Expo and Reports Due
During 2020 exam period, schedule TBA	Final Exam

\* Please note that these dates are subject to change with notice.

## **POLICIES**

### **Academic Integrity**

You are expected to exhibit honesty and use ethical behavior 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 behavior can result in serious consequences, *e.g.* the 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:

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

### **Authenticity/Plagiarism Detection**

All submitted work is subject to normal verification that standards of academic integrity have been upheld (*e.g.*, on-line search, etc.).

### **On-line Access**

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, usernames 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 instructors.

### **Academic Accommodations for Students with Disabilities**

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. 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 Academic Accommodation of Students with Disabilities policy.

### **Request for Relief for Missed Academic Work – McMaster Student Absence Form (MSAF)**

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”. It is the prerogative of the course instructors to determine the appropriate relief for missed term work. It is highly discouraged to miss the Design Tutorials, as these prepare you for your Design Project.

### **Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)**



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 their Faculty 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.

### **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 members of the university community to practice and to promote ethical behavior. To see the Policy on Research Ethics at McMaster University, please go to <https://reo.mcmaster.ca/>.

### **Pedagogical Study**

For the study of education, you may be asked to provide information or feedback about course components. When possible, the instructor will share these results with participants.

## **DESIGN STUDIO AND TUTORIALS**

### **LAB SAFETY**

The bulk of your team design work and tutorial sessions will take place in ABB C104, the new Design Studio for the iBiomed program.

Please refer to the separate document 'Design Studio Safety ABB-C104' which can be found as a separate PDF on Avenue. This document must be reviewed before working the Design Studio.