



Integrated Biomedical
Engineering & Health
Sciences Program

IBEHS 3P04 Syllabus

Winter 2022

Health Solutions Design Projects III



IBEHS 3P04: Health Solutions Design Projects III Winter 2021

COURSE CO-INSTRUCTORS

Dr. Lina Santaguida, PhD Office: MUMC Ext. 22149
Assistant Professor, Department of Health Research Methods, Evidence, and Impact
santag@mcmaster.ca

Dr. Qiyin Fang, PhD, PEng (LEL) Office: ETB 405 Ext. 24227
Professor, Department of Engineering Physics
qiyin.fang@mcmaster.ca

COURSE EMAIL: For questions related to administration (e.g., MSAF, accommodations, scheduling, grouping, grade review, etc.), please contact both instructors using the e-mail listed above. For questions around design studio and submissions, please contact your Design Studio TA (e-mail listed below). Please cc both instructors' e-mail for all course correspondence including communication with the TAs.

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

Lead TA: Ali Ammar (ammara@mcmaster.ca)
Mondays: Ian Phillips (phillih@mcmaster.ca)
Tuesdays: Kierra McDougall (mcdougak@mcmaster.ca) & Ali Ammar
Wednesdays: Ethan Danielli (daniee4@mcmaster.ca) & Ian Phillips
Thursdays: Minha Amir (amirm13@mcmaster.ca) & Ali Ammar
Fridays: Monica Malek (malekm10@mcmaster.ca) & Ian Phillips

LAB TECHNICIAN

Parmveer Bola Office: ETB 534A
bolap1@mcmaster.ca Office Hours: by appointment

FACULTY MENTORS

Faculty mentors from the School of Rehabilitation Science, Department of Surgery, and the Faculty of Engineering will join us online during Design Studio time during certain weeks to provide additional multidisciplinary mentorship and support.

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 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 injury.

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

TIMETABLE

Given current restrictions due to COVID-19, we will be offering IBEHS 3P04 in Winter 2021 as a fully virtual/online course. A combination of asynchronous and synchronous lectures and tutorials will be provided to students. Please assume synchronous lectures and tutorials at the indicated times unless otherwise notified.

LECTURES: Tuesdays 12:30 – 13:20; Thursdays 14:30 – 15:20
Classroom for in-person lectures: **ITB AB102**
Platform for online lectures: Microsoft Teams
Delivery Mode: Synchronous Online between January 11 and February 17, in-person there after.
Note: delivery mode may subject to changes mandated by the University and the Governments.

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 Delivery Mode: Synchronous online between Jan. 11-28. Hybrid with 50% in person capacity there after.

Note: delivery mode may subject to changes mandated by the University and the Governments.

LEARNING OUTCOMES

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

LO.01	Apply engineering knowledge in designing a feasible solution to a health problem
LO.02	Identify appropriate use of methods and models to analyze a technical problem in the health care space.
LO.03	Work effectively in a team structure, managing time, prioritizing tasks and taking leadership when appropriate
LO.04	Communicate design process and decision-making in both written and oral formats and effectively respond to questioning
LO.05	Incorporate engineering economics principles in design decision-making
LO.06	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 virtual 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 Computer Infrastructure

IBEHS 3P04 Winter 2022 is planned to be offered in person. Due to pandemic situation changes, it has been modified to a mix of synchronous online to hybrid in-person and online. The online learning environment consists of both synchronous and asynchronous elements. Students will need access to a strong internet connection and the ability to join lectures through video and/or audio. Please contact the instructors if you have any concerns about participating in this way online.

Required Texts

'Engineering Economics: Financial Decision Making for Engineers' Sixth Edition. Editors; NM Fraser, EM Jewkes, M Pirnia. Pearson Canada Inc. 2017. Note that this same textbook will be used in IBEHS 4P04.

Some hardware components required for the design project are included in a custom course kit, available at the McMaster University Campus Store. Each student in the course is required to have all components listed in this kit (detailed list provided in the course Avenue site).

All additional course materials will be included on the IBEHS 3P04 Avenue site.

Required Software and Materials

Students are encouraged to have their own copy of MATLAB (Mathworks) for processing use in their design projects. MATLAB is used in multiple courses throughout the iBioMed program and it is now available at the Campus Store for no additional cost with a valid student ID (<https://campusstore.mcmaster.ca/computers/software-licences.html>).

Online Management

The Course Management System will be Avenue to Learn (<http://avenue.mcmaster.ca/>). The student is expected to check this system daily. All course content, scheduling, assignments, announcements, and grading will be managed here.

COURSE OVERVIEW and ASSESSMENT

Lecture and Design Studio Attendance

A combination of asynchronous (online) and synchronous (online and in person) lectures will be provided to students. Please assume synchronous lectures at the indicated times unless otherwise notified. If a pre-recorded lecture is provided in a given week, the lecture period will be used for synchronous discussion. Students are strongly encouraged to review weekly posted lectures (asynchronous) and synchronous virtual lectures, and to participate in classroom discussions on the content weekly. All online synchronous lectures will be recorded and available to students after the lecture. Staying up to date on lecture content will support success and advancement of design projects.

Students are assigned to specific Design Studio sections and will assemble in pre-defined groups. Students must attend the day and time of the session they have been assigned weekly. Each group will have a dedicated channel on Microsoft Teams, and they are free to use this channel outside of Design Studio time for group meetings and organization. During Design Studio time, TAs will provide updates and overviews on design project tasks; and will be available for guidance and answering questions related to the design project. Faculty mentors will also be available for support and discussion at specific design studios throughout the term.

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.

All milestones and assignments will be submitted through the Assessments tab in Avenue to Learn. If the milestone or assignment requires custom code to be developed and used, we ask that students please append the code to their submission. However, it is important to note that a submission of code (for instance a MATLAB .m file) does not constitute an assignment solution and will not be graded as such. Students must directly answer questions posed, with clear written communication.

For each assignment/milestone, specific requirements may apply, including naming conventions for individual and group submissions respectively. Please carefully read and follow these instructions.

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.

Late Submission Policy

Students are referred to the University secretariat policy on missed academic work at: <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/msaf-mcmaster-student-absence-form/>. Student can request relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to 3 calendar days by submitting an MSAF (McMaster Student Absence Form) online once during the term. Students are asked to follow-up with the instructors after submitting this form to determine the appropriate relief.

Otherwise, students are expected to submit all milestones and assignments by the deadline indicated or they will not be graded. Please reach out to course instructors directly if there are any issues or concerns.

Assessments and Exams

Students will be evaluated based on a series of milestones that assess their learning and progress through the design process, as well as through a series of assignments aimed to evaluate their understanding of the underlying biomechanics and economics content being applied in the design process. All cumulative assessments and exams must be written. There will be no midterms in the course. In lieu of these, students will be asked to demonstrate their understanding through the design project milestones, assignments, and in a take-home final examination.

Students are asked to come directly to the course instructors if they have any questions or concerns regarding graded assessments or evaluations. Re-grading will only be considered in warranted circumstances.

ASSESSMENT DETAILS

Final Grade Component	Weight
Project Zero	5%
Design Project*	45%
Assignments	20%
Exams (midterm: 10%; Final: 20%)	30%

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

IMPORTANT DATES

January 10, 2022	Design Studios Begin
January 11, 2022	Lectures Begin
Jan 10 – 28, 2022	Project Zero
January 31 – April 15, 2022	Main Design Project
Feb 21 – Feb 25, 2022	Reading Week
Thursday March 3, 2022	Midterm exam
Apr 5 - Apr 15, 2022	Design Project Expo and Reports Due
During 2021 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.
4. Use and contributing to online solution services such as Chegg are considered as academic dishonesty.

Authenticity/Plagiarism Detection

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

Teamwork, professionalism, and communication skills are important learning objectives in this course. They will be evaluated through group work, breakout discussions, as well as presentations. We require the students to have proper equipment to enable live video and audio during the lectures and tutorials. We recommend the students turn on their camera during live video interactions in class and Design Studio sessions with virtual background functions to minimize privacy issues.

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. 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.

Use of Online resources

Proper use of online or other resources are permitted. Proper citation and credit to the original source is required. The students are required to understand the context and content of the resource before using them. The students are responsible for the accuracy and quality of the resources used.

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 Design Studio is currently open to student access during time frames specifically designed to each group or by appointment only.

Some of your design work and tutorial sessions will take place in your own residences. Please refer to the following web site for study and work from home safely:

<https://covid19.mcmaster.ca/health-safety/staying-safe-at-home/>

Integrated Biomedical Engineering & Health Sciences (IBEHS) Labs/Design Studio Safety

Information for Laboratory Safety and Important Contacts

This document is for users of IBEHS instructional laboratories at the following locations:

- ABB C104 (Design Studio)

This document provides essential information for the healthy and safe operation of IBEHS instructional laboratories. This document is required reading for all laboratory supervisors, instructors, researchers, staff, and students working in or managing instructional laboratories in IBEHS. It is expected that revisions and updates to this document will be done continually. A McMaster University [lab manual](#) is also available to read in every laboratory.

General Health and Safety Principles

Good laboratory practice requires that every laboratory worker and supervisor observe the following:

- Food and beverages are not permitted in the instructional laboratories.
- A Laboratory Information Sheet on each lab door identifying potential hazards and emergency contact names should be known.
- Laboratory equipment should only be used for its designed purpose.
- Proper and safe use of lab equipment should be known before using it.
- The lab tech or course TA leading the lab should be informed of any unsafe conditions.
- The location and correct use of all available safety equipment should be known.
- Potential hazards and appropriate safety precautions should be determined, and the sufficiency of existing safety equipment should be confirmed before beginning new operations.
- Proper waste disposal procedures should be followed.
- [Personal ergonomics](#) should be practiced when conducting lab work.
- [Current University health and safety](#) issues and protocols should be known.