IBEHS 1EP6 A/B

Entrepreneurship in Biomedical Innovation: Bench to Market

Fall/Winter Terms (2025-26)

Course Outline

Welcome to your first year in the iBioMed program ☺

This Course Outline provides you with information about IBEHS 1EP6 – its structure, content, evaluations, and delivery. Please read through all sections carefully and refer to it throughout the academic year.

Calendar/Course Description

This is a project-based integrated learning course where we will use advancements in the biomedical field to explore cellular mechanisms underlying human health and pathology and follow the journey of healthcare solutions from bench to market. There will be a focus on the synthesis of key concepts in cellular biology with clinical developments and business perspectives. This course will develop critical thinking, teamwork, and project management skills.

Pre-Requisites and Anti-Requisites

Prerequisite(s): Registration in the Integrated Biomedical Engineering and Health Sciences (IBEHS) program
Antirequisite(s): none

Instructor Office Hours and Contact Information

Dr. Michelle MacDonald
MDCL 3515
macdonml@mcmaster.ca

Dr. Anna Korol
MDCL 3515
korola3@mcmaster.ca

Office Hours:

- Drop-in open office hours with instructors held **every** Thursday 4:30-5:30pm in Peter George Centre for Living & Learning (PGCLL) M21.
- To request a one-on-one appointment please email the instructor directly.

Instructional Team

Head TAs: Each tutorial and lab section will have designated head TAs that supervise tutorial or lab activities, provide project support and oversee student progress.

- Olivia Cirone, cironeo@mcmaster.ca (Head Tutorial TA)
- Matthew Siracusa, siracusm@mcmaster.ca (Head Tutorial TA)
- Avery Brennan, brenna11@mcmaster.ca (Head Lab TA)
- Maya Thomas, thomam55@mcmaster.ca (Head Lab TA)

Instructional TAs: Each section will have an Instructional TA that will guide your tutorial and laboratory activities and will be your weekly point of contact for your section.

- Devan Patel, pated238@mcmaster.ca (T01Monday, Term 1; Marking, Term 2)
- Monica Cornea, corneam@mcmaster.ca (Marking, Term 1, T01 Mondays, Term 2)
- Scarlett Wang, wangs570@mcmaster.ca (T02 Monday)
- Rory Sucharov-Gluck, sucharor@mcmaster.ca (T03 Tuesday)
- Jasmine Ren, renj56@mcmaster.ca (T04 Tuesday)
- Georgia Campbell, campbg20@mcmaster.ca (T05 Wednesday)
- Judie Khater, khatej1@mcmaster.ca (T06 Wednesday)
- Adriana Salerno, salera1@mcmaster.ca (T07 Friday)
- Vanessa Ishak, ishakv@mcmaster.ca (T08 Friday)
- Ava Beech, beecha1@mcmaster.ca (Marking)

Additional Instructional Support

Laboratory Technician: prepares and leads each of your wet labs; manages the lab space; provides training on use of equipment; supports all lab activities.

Andrej Rusin
Email: rusina@mcmaster.ca

Laboratory Mentor: provides guidance, technical knowledge and feedback during wet labs.

Dr. Aftab Taiyab
Email: taiyab@mcmaster.ca

Course Schedule

Students will complete two "Investigations" throughout the year (INV-1 during term 1 and INV-2 during term 2). Each investigation explores a different field of the health sciences. The aim is for you to bridge the gap between cellular biology topics and their real-world applications. Each investigation includes tutorial and lab activities where students will work individually and in groups. These will be further explained in the Investigation packages provided on Avenue to Learn.

The course is delivered in a two-week cycle (**module**) starting on Thursdays. Within each module, you will have: one lecture, one tutorial and one laboratory (lab). Tutorials and labs will occur in alternating weeks.

LECTURES: pre-recorded lecture posted every other Monday.

- Lectures can be viewed on-demand or with peers during in-person office hours (see "office hours" above).
- *Objective*: Introduce fundamental topics and are meant to inform tutorial and lab activities.

TUTORIALS: 2 hours 50 minutes in length. Tutorials will generally be held every other week (check your schedule on Mosaic for your tutorial section, ie. T01, T02, etc…).

- Check the *Course Schedule* on Avenue for "odd" and "even" section schedule.
- Also check the *Lab and Tutorial Schedule* posted on Avenue for more details.

- Location: check your schedule on Mosaic.
- *Objective*: Tutorials will occur in small groups led by TAs and are a dedicated time to collaborate as a team on tutorial tasks and project activities.

LABORATORIES (WET LABS): Labs are generally 2 hours 50 minutes in length and held every other week. There will be some exceptions as noted in the *Course Schedule* and *Lab and Tutorial Schedule.*

- Check the *Course Schedule* on Avenue for "odd" and "even" section schedule.
- Also check the *Lab and Tutorial Schedule* posted on Avenue for more details.
- *Location*: **HSC-4H13**
- *Objective*: Labs introduce and reinforce application of scientific techniques in cellular biology. Labs will include videos and activities to be completed before each lab (pre-lab) and lab tasks to be completed individually after each lab (post-lab). Pre-labs and post-labs will generally be completed in lab, with some exceptions. Labs will be run by the lab technician with guidance from the lab mentor and TAs.
- IMPORTANT: Lab cleanliness is important. Dispose of any disposables and clean your bench space as directed by the lab technician and your TA. You must seek approval from your TA before leaving the lab.

Course Delivery

We will be using two virtual learning platforms – **Avenue to Learn** and **Microsoft Teams**.

Avenue-to-Learn will be the online management system for the course. Through **Avenue to Learn**, you will be able to:

- Find all course materials (course outline, pre-recorded lectures and slides, tutorial tasks, lab materials, project documents, assessment documents etc.)
- View course-related announcements
- Complete online pre-lab and post-lab activities
- Submit course work for grading (tutorial tasks, lab activities, bio-bytes, project deliverables)
- View your gradebook

Microsoft Teams will be used as a communication and collaboration tool.

- Each of you will see two 1EP6 Teams: (1) a general Team for the whole 1EP6 course where you can communicate with the instructional team; (2) a tutorial Team to collaborate with your tutorial group under the mentorship of your TAs.

Materials and Fees

Textbooks

There is *no required textbook* for the course. All required reading materials will be made available for free as online documents through the course management system (Avenue) and through use of peer-reviewed literature available online through the McMaster library.

Lab Equipment

For labs, each student will require a **lab coat and safety glasses** which must be brought to each lab. Gloves will be provided.

Labs are located within the hospital building (HSC-4H13). McMaster University encourages but does not require the use of wearing a medical mask indoors, such as in classrooms, libraries, labs, crowded spaces close workspaces. The University continues to monitor the situation closely and update the covid19.mcmaster.ca website.

Course Objectives and Learning Outcomes (LO)

Upon successful completion of the course, the student should be able to:

LO.01	**Identify** the molecular interactions and functions of proteins, enzymes, and other biologically relevant molecules in cellular mechanisms
LO.02	**Compare** signal transduction mechanisms in the healthy and pathological state
LO.03	**Outline** the impact of disease on clinical, market and socioeconomic outcomes
LO.04	**Propose** a research avenue or treatment for a pathological condition using evidence from the scientific literature
LO.05	**Select** experimental methods and techniques to investigate a hypothesis
LO.06	**Work** in high-functioning groups that have specialized roles to complete deliverables
LO.07	**Communicate** scientific information effectively to various audiences

Assessments

The course is assessed through two different **investigations**.

INVESTIGATION (INV)	WEIGHT
INV-1 Cellular Mechanotransduction (Term 1)	**50%**
INV-2 Innovation in Neurobiology (Term 2)	**50%**

For each of the investigations above, the assessment weights are broken down below:

GRADING MODULE	WEIGHT
Tutorials (group)	**30%**
Tutorial Activity (n=4)	7.5% each
Wet Labs	**20%**
Pre-labs (n=4)	1% each
Post-labs (n=4)	4% each
Mini Assignments	**20%**
Bio-Bytes (n=4)	5% each
Major Assessments	**30%**
Group Project Final Presentation (group)	20%
Final Research Proposal (individual)	10%

There will also be opportunities for bonus marks:

BONUS	WEIGHT
Crash Course Avenue quiz	1%

Completion and Submission of Work

It is the student's responsibility to ensure assessments are correctly submitted to the correct location, on time, and in the specified format. ***Failure to correctly submit an assignment will result in a mark deduction*** (see below).

Alternative Evaluation for Tutorial or Lab Absence

Attendance in tutorials and labs is required, in-person. If a student is unable to attend a tutorial or lab as a result of unforeseen and/or uncontrollable circumstance(s), the student will submit an alternative assessment.

Submission Penalties

Please be aware of the following penalties for assessments:

- All tutorial assessments, post-labs, mini assignments and major assessments must be uploaded to Avenue to Learn by the posted deadline, or they will be subject to a **late penalty of 20% per day**.
- Submissions must be in the correct format, or they will be subject to a **10% deduction**.
  - It is your responsibility to ensure any electronic submissions can be opened by the TA.
- Pre-labs must be completed before entering the lab or will result in a mark of zero, with no exceptions.
- **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**.

Completion of Major Assessments

All **Major Assessments** must be completed. In a case where the component weight cannot be fulfilled as a result of unforeseen and/or uncontrollable circumstance(s), the grades assigned to that component may be pro-rated.

Important Dates

A detailed course schedule with due dates and investigation topics can be found in the ***Course Schedule*** on Avenue.

Communication Policy

Tutorials are the best place to ask questions and to get the help you need. During tutorials, you will have access to mentorship from your assigned TA and head TA. If questions do remain in between sessions, please ask your TAs for their preferred form of communication (i.e. email or Microsoft Teams).

Open office hours are a great resource available to connect with your instructors and peers. You do not need to have questions to attend and are free to use the space during the allotted time for group or individual work.

To contact the instructors, please email directly. Please do not use Avenue to Learn or Microsoft Teams. The most frequently asked questions and/or important questions will be addressed by the instructors. Content-related questions will not be answered via email since misunderstandings can arise. Every attempt will be made to reply within 24 hours (excluding weekends). When emailing please include a subject prefix of "IBEHS 1EP6", use appropriate and professional conduct (e.g., salutation) and include your full name and student number in your email. Emails must be sent from your @mcmaster.ca account.

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 of this preference early in the semester so that we may make appropriate changes to our records.

Accreditation

The Graduate Attributes defined in this section are measured for Accreditation purposes only and will not be directly taken into consideration in determining a student's actual grade in the course. For more information on Accreditation, please visit: https://www.engineerscanada.ca. Mapping of the course **Learning Outcomes (LO)** to the Canadian Engineering Accreditation Board (CEAB) **Graduate Attributes (GA)** are outlined in the table below:

GRADUATE ATTRIBUTE	LEARNING OUTCOME(S)
GA01 - Knowledge Base for Engineering	
1.2 – Competence in natural sciences	LO.01, LO.02
GA02 Problem Analysis	
2.1 – Identifies and states reasonable assumptions and suitable engineering fundamentals, before proposing a solution path to a problem.	LO.03
2.2 – Proposes problem solutions supported by substantiated reasoning, recognizing the limitations of the solutions.	LO.04
GA03 Investigation	
3.1 – Selects appropriately from relevant knowledge base to plan appropriate data collection methods and analysis strategies.	LO.03, LO.04
3.2 – Synthesizes the results of an investigation to reach valid conclusions.	LO.05
GA06 Teamwork	
6.1 – Actively contributes to the planning and execution of a team project.	LO.06
6.2 – Manages interpersonal relationships, taking leadership responsibilities as needed.	LO.06
GA07 Communication	
7.1 – Demonstrates comprehension of technical and non-technical instructions and questions.	LO.07
7.2 – Composes an effective written document for the intended audience.	LO.07
7.3 – Composes and delivers an effective oral presentation for the intended audience.	LO.07

For more information on Accreditation, please visit: https://www.engineerscanada.ca.

CEAB Accreditation Units: 50% Natural Science, 50% Complimentary Studies

McMaster Approved Policy Statements

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with University functions on online platforms (e.g., use of Avenue to Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

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 behaviour 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. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty:

- Plagiarism, e.g., submission of work not one's own or which other credit been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

Authenticity / Plagiarism Detection

In this course we will be using a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. Students will be expected to submit their work electronically either directly to Turnitin.com or via Avenue to Learn (A2L) plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish to submit their work through A2L and/or Turnitin.com must still submit an electronic and/or hardcopy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com or A2L. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). To see the Turnitin.com Policy, please go to the following website: www.mcmaster.ca/academicintegrity.

Use of Generative Artificial Intelligence (AI) Prohibited

Students are not permitted to use generative AI in this course. In alignment with McMaster Academic Integrity Policy, it "shall be an offence knowingly to … submit academic work for assessment that was purchased or acquired from another source". This includes work created by generative AI tools. Also stated in the policy is the following, "Contract Cheating is the act of "outsourcing of student work to third parties" (Lancaster & Clarke, 2016, p. 639) with or without payment." Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

Academic Accommodations for Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Academic Accommodation for Religious, Indigenous, or Spiritual Observations (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students 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 examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Academic Accommodations 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".

- All MSAFs are to be directed to the professors through email. Sending to another email address will delay processing.
- It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.

Lab Late Policy

Labs will begin promptly at 2:30pm on Monday, Tuesday, Wednesday, and Friday in HSC-4H13. If you are late to lab, you will be assigned a mark of 0% on the associated pre-lab assignment.

Courses with an On-Line Element

In this course, we will be using **Avenue to Learn** and **Microsoft Teams**. 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 email 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 instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Reference to 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 all members of the university community to practice and to promote ethical behaviour. To see the Policy on Research Ethics at McMaster University, please go to https://reo.mcmaster.ca/.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.

Notice Regarding Possible Course Modification

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

Pedagogical Study

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

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)
- ETB 533 (Medical Imaging/Biomaterials Lab)
- ETB 534 (Medical Instrumentation/Robotics Lab)
- HSC 4H13 (Tissue and Genetic Engineering Lab)

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. At McMaster University, HR maintains Health & Safety information that is also available at https://hr.mcmaster.ca/employees/health_safety_well-being/our-safety/lab-safety/.

Details on Standard Operating Procedures (SOPs), Health and Safety videos and other resources can be found online at the iBioMed Health and Safety webpage.

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.

Location of Safety Equipment

Fire Extinguisher: on walls in halls outside of labs or within labs

First Aid Kit: ABB C104, ETB 533, ETB 534, HSC 4H13 or dial “88” after 4:30 p.m.

Telephone: on the wall of every lab near the door

Fire Alarm Pulls: Near all building exit doors on all floors

Who to Contact?

Emergency Medical / Security:

On McMaster University campus, call Security at extension **88** or **905-522-4135** from a cell phone.

Hospital Emergency Medical / Security:

For McMaster HSC, call Security at extension **5555** or **905-521-2100** from a cell phone.

Non-Emergency Accident or Incident: Immediately inform the Lab Tech, TA on duty or Course Instructor.

University Security (Enquiries / Non-Emergency):

Dial 24281 on a McMaster phone or dial 905-525-9140 ext. 24281 from a cell phone.

See Lab Tech, TA or Instructor: For problems with heat, ventilation, fire extinguishers, or immediate repairs.

Environmental & Occupational Health Support Services (EOHSS): For health and safety questions dial 24352 on a McMaster phone or dial 905-525-9140 ext. 24352 from a cell phone.

IBEHS Specific Instructional Laboratory Concerns: For non-emergency questions specific to the IBEHS laboratories, please contact appropriate personnel below from a McMaster phone:

- Leela Pilli, Laboratory Technician – 26888
- Parmveer Bola, Instructional Assistant – 23521
- Andrej Rusin, Wet Laboratory Technician – 28347
- Alexa Behar-Bannelier, Program Manager – 24548

In Case of a Fire (Dial 88)

When calling to report a fire, give name, exact location, and building.

1. Immediately vacate the building via the nearest Exit Route. Do not use elevators!
2. Everyone is responsible for knowing the location of the nearest fire extinguisher, the fire alarm, and the nearest fire escape.
3. The safety of all people in the vicinity of a fire is of foremost importance. But do not endanger yourself!
4. In the event of a fire in your work area shout "*Fire!*" and pull the nearest fire alarm.
5. Do not attempt to extinguish a fire unless you are confident it can be done in a prompt and safe manner utilizing a hand-held fire extinguisher. Use the appropriate fire extinguisher for the specific type of fire. Most labs are equipped with Class A, B, and C extinguishers. Do not attempt to extinguish Class D fires which involve combustible metals such as magnesium, titanium, sodium, potassium, zirconium, lithium, and any other finely divided metals which are oxidizable. Use a fire sand bucket for Class D fires.
6. Do not attempt to fight a major fire on your own.
7. If possible, make sure the room is evacuated; close but do not lock the door and safely exit the building.

Clothing on Fire

Do not use a fire extinguisher on people.

1. Douse with water from safety shower immediately or
2. Roll on the floor and scream for help or
3. Wrap with fire blanket to smother flame (a coat or other non-flammable fiber may be used if a blanket is unavailable). Do not wrap a standing person; rather, lay the victim down to extinguish the fire. The blanket should be removed once the fire is out to disperse the heat.

Equipment Failure or Hazard

Failure of equipment may be indicative of a safety hazard - You must report all incidents. Should you observe excessive heat, excessive noise, damage, and/or abnormal behaviour of the lab equipment:

1. Immediately discontinue use of the equipment.
2. In Power Lab, press the wall-mounted emergency shut-off button.
3. Inform your TA of the problem.
4. Wait for further instructions from your TA.
5. TA must file an incident report.

Protocol for Safe Laboratory Practice

Leave equipment in a safe state for the next person - if you are not sure, ask!

Defined Roles

IBEHS Lab Technician	Leela Pilli, pillil@mcmaster.ca
IBEHS Instructional Assistant	Parmveer Bola, bolap1@mcmaster.ca
IBEHS Wet Lab Technician	Andrej Rusin, rusina@mcmaster.ca
IBEHS Co-Directors	Dr. Colin McDonald, cmcdona@mcmaster.ca Dr. Michelle MacDonald, macdonml@mcmaster.ca
IBEHS Program Manager	Alexa Behar-Bannelier, huanga2@mcmaster.ca
IBEHS Course Instructor	Please contact your specific course instructor directly.