IBEHS 2P03 SYLLABUS
WINTER 2021

ADMINISTRATIVE DETAILS

COURSE INSTRUCTORS:

Dr. Zeinab Hosseini-Doust
doust@mcmaster.ca
Office: ABB-C 306
Office Hours: By Email Appointment

Dr. Vincent Leung
leungv@mcmaster.ca
Office: JHE-A408A
Office Hours: By Email Appointment

TEACHING ASSISTANTS

EMAIL POLICY

Every attempt will be made to reply within 24 hours (excluding weekends). Please include a subject prefix of "IBEHS 2P03". Emails must be sent from your @mcmaster.ca account. Be sure to include your student number in your email.

COURSE DESCRIPTION

This course is designed to introduce students to Genetic Engineering in the Health Sciences, from a molecular research perspective. It engages students in laboratory related skills specific to genetic engineering. IBEHS 2P03 is also a Design Project course built to emphasize a tight-knit community of students, staff and teaching assistants working together on a semester-long Genetic Health Solutions project. The students will form groups on week 1 and choose a health problem. Each week, fundamental biochemistry topics will be discussed in lectures and students will participate in Design Tutorials and Biochemical Virtual Lab Experiments aimed at developing the skills and knowledge required for completing the Design Project.

LECTURES: Thursdays 18:30-19:20
Fridays 17:30-18:20

DESIGN TUTORIALS/WET LABORATORIES: (2 hour 50 minutes per week)

Section	Date and Time	DT Location	WL Location	TA 1(Marking)	TA 2
L01	Tues. 8:30-11:20	TBD	MS Teams	TBD	TBD
L02	Thur. 8:30-11:20	TBD	MS Teams	TBD	TBD
L03	Fri. 8:30-11:20	TBD	MS Teams	TBD	TBD
L04	Mon. 14:30-17:20	TBD	MS Teams	TBD	TBD
L05	Tues. 14:30-17:20	TBD	MS Teams	TBD	TBD
L06	Thur. 14:30-17:20	TBD	MS Teams	TBD	TBD
L07	Fri. 14:30-17:20	TBD	MS Teams	TBD	TBD

Timetable

Week	Week of	Lectures	Design Tutorials (DT) /Wet Labs (WL)
1	Jan. 4	Introduction to the Course	No DT or WL
2	Jan. 11	Module 1: Review of Central Dogma	DT-1: Team Formation & Intro to Design Project
3	Jan. 18	Module 2: Intro to Synthetic Biology	DT-2: Intro to SimBiology
4	Jan. 25	Module 2: Intro to Synthetic Biology	DT-3: Benchling and Experimental Design
5	Feb. 1	Module 2: Intro to Synthetic Biology	WL-1: Basic Lab Skills and Experimental Design
6	Feb. 8	Module 3: Intro to Molecular Cloning	WL-2: Bacterial Growth
7	Feb. 15	Break	Break
8	Feb. 22	Module 3: Intro to Molecular Cloning	WL-3: Molecular Biology and Synthetic Biology
9	Mar. 1	Module 3: Intro to Molecular Cloning	DT-4: Constructing a Circuit in SimBiology
10	Mar. 8	Module 4: Modeling Biological Systems	DT-5: Building the Design Project Model
11	Mar. 15	Module 4: Modeling Biological Systems	DT-6: Technical Writing and Poster Presentation
12	Mar. 22	Module 4: Modeling Biological Systems	No DT or WL
13	Mar. 29	Module 5: Bioethics	DP Poster Presentation

*Dates subject to change **with** notice

LEARNING OUTCOMES

Upon successful completion of the course, the student should be able to:	
LO.01	Apply the elements of engineering design to manipulate DNA (genetic material)
LO.02	Use software and computer aided design effectively for *in silico* genetic engineering
LO.03	Appreciate the breadth of genetic engineering applications in the Health Sciences
LO.04	Demonstrate effective application of Biochemical experimental design processes
LO.05	Explain the health and safety responsibilities of a professional bioengineer
LO.06	Learn the core skills and tools to perform hands-on genetic engineering
LO.07	Demonstrate self-directed, problem-based learning skills
LO.08	Demonstrate effective scientific and technical communication, both orally and in writing
LO.09	Demonstrate effective contributions as a significant member of a Design Team
LO.10	Develop a mathematical model for a biological system

ACCREDITATION LEARNING OUTCOMES

The Learning Outcomes 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.

Learning Outcomes	Indicators
LO.01 Apply the elements of engineering design to manipulate DNA (genetic material)	1.4, 4.3
LO.02 Use software and computer aided design effectively for *in silico* genetic engineering	3.2
LO.03 Appreciate the breadth of genetic engineering applications in the Health Sciences	1.2, 12.2
LO.04 Demonstrate effective application of Biochemical experimental design processes	1.4, 2.1, 4.1
LO.05 Explain the health and safety responsibilities of a professional bioengineer	8.1, 9.1, 10.1
LO.06 Learn the core skills and tools to perform hands-on genetic engineering	3.3
LO.07 Demonstrate self-directed, problem-based learning skills	12.1
LO.08 Demonstrate effective scientific and technical communication, both orally and in writing	7.3
LO.09 Demonstrate effective contributions as a significant member of a Design Team	6.2
LO.10 Develop a mathematical model for a biological system	2.3, 3.2

TEXTBOOKS & MATERIALS

REQUIRED TEXTS

None

OPTIONAL TEXTS

This course does not have a textbook, the following guidebook is available for free and will be helpful as a primer to synthetic biology: *Synthetic Biology Guidebook for iGem High School* http://igem.org/wiki/images/7/71/AITF_iGEMHS_Guidebook_Final.pdf

REQUIRED SOFTWARE

1. MATLAB (https://www.mathworks.com/academia/tah-portal/mcmaster-university-31501097.html%22.html)
    a. SimBiology Toolbox
2. Benchling (https://www.benchling.com/)

PERSONAL LAB SAFETY GEAR

Every student needs a lab coat and safety glasses. Gloves will be provided.

Note: This year, all labs will be administered virtually through Labster (https://www.labster.com/).

CALCULATOR

Any calculator may be use during tests and exams.

ONLINE MANAGEMENT

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

COURSE OVERVIEW, ASSESSMENT & IMPORTANT DATES

WET LAB AND DESIGN TUTORIAL ATTENDANCE

Students have been assigned specific Wet Lab and Design Tutorial sections. When attending Wet Labs and Design Tutorials, students must attend the assigned room and section. Any assessment completed by a student in a different section other than the one assigned will not be graded.

SUBMISSION OF WORK

It is the student's responsibility to ensure assessments are correctly submitted to correct location (e.g. handed in to TA, Avenue Dropbox, Portfolio, etc.), on time, and in the specified format. ***Failure to correctly submit an assignment will result in a mark deduction***. Grades for Lab Assignments, Design Project work, and Milestones will be posted to Avenue within 7 days after submission. ***You will have 7 days from the date of return to address any concerns you may have to the Course Instructor or your Lab TA.***

SUBMISSION PENALTIES

Please be aware of the following penalties for Design Project and Lab Assignments:

- Design Project:
    - Milestone Reports, MATLAB simulations, Poster drafts etc. – unless explicitly indicated all Design Project work is to be submitted to the correct dropbox on Avenue to Learn. They must be ***submitted by 11:59 pm*** on deadline day to be considered for grading.
- Design Tutorial:
    - Assignments are to be submitted to the correct dropbox on Avenue to Learn. They must be ***submitted by 11:59 pm*** on deadline day to be considered for grading.
- Wet Labs:

- Pre-labs, assignments, and lab report are to be submitted to the correct dropbox on Avenue to Learn. Pre-lab must be submitted before the lab period. Assignments and report must be ***submitted by 11:59 pm*** on the due date.

- General:
  - It is your responsibility to ensure any electronic submissions can be opened by the TA (submit as single PDF file). 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

CUMULATIVE ASSESSMENTS AND EXAMS

All Cumulative Assessments (Posters) and Tests **must be handed in and written, respectively**. Failure to do so 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 unforeseen and/or uncontrollable circumstance(s) in the course operation or execution, the grades assigned to that component will be pro-rated.

ASSESSMENT

FINAL GRADE COMPONENT	WEIGHT
Design Projects*	**50%**
Milestone 1	(5%)
Milestone 2	(5%)
Milestone 3	(5%)
Milestone 4	(5%)
Milestone 5	(10%)
Milestone 6	(15%)
Peer Evaluation	(5%)
Lab Assignments	**15%**
Lab Assignments	(5%)
Lab Test	(10%)
Design Tutorials	**10%**
DT-2 Assignment	(3%)
DT-3 Assignment	(3%)
DT-4 Assignment	(4%)
Exams	**25%**
Final Exam (Take Home)	(25%)

MILESTONE SCHEDULE

Description	Due Date
M1: Background on Selected Health Problem	One week after DT-1 (Jan. 20 – 24)
M2: Biological Parts Selection	One Week after DT-3 (Feb. 3-7)
M3: Materials and Methods	One Week after WL-2 (Feb. 24-28)
M4: SimBiology Model of Circuit	One Week after DT-5 (Mar. 16-20)
M5: Poster Presentation	April 1
M6: Scientific Journal Article	April 3

*Dates subject to change **with** notice.

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 Learning Outcomes listed above to the Canadian Engineering Accreditation Board (CEAB) Graduate Attributes can be obtained from the Instructor.

ACADEMIC POLICIES

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.

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.

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 been obtained.
2. Improper collaboration in group work.
3. 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 www.mcmaster.ca/academicintegrity.

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, user names 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 instructor.

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"

1. All MSAFs are to be directed to leungv@mcmaster.ca. Sending to another email address will delay processing.
2. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.
    - In the event an MSAF is applied to the following lab assessments/assignments, **they will be rescheduled**:
        - End-of-Year Cumulative Assessments (e.g. Poster Presentation, Final Report)

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.

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 (e.g., severe weather, labour disruptions, etc.). 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.

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/.

PEDAGOGICAL STUDY

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

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 so that we may make appropriate changes to our records.