



# **IBEHS 4C03**

## **Statistical Methods in Biomedical Engineering**

### Term (2023)

### Course Outline

#### **Calendar/Course Description**

Probability theory, random variables, random processes, statistical inference, regression, correlation, error analysis, and experimental design.

#### **Pre-Requisites and Anti-Requisites**

Prerequisite(s): Registration in Level III or above of the Integrated Biomedical Engineering and Health Sciences (IBEHS) program

Antirequisite(s): STATS 3J04, STATS 3Y03, MATLS 3J03

#### **Course Schedule**

Lectures: Lectures on Mon, Wed 8:30-9:20am. Fri 10:30-11:20am. BSB 120

Tutorials: Tutorial on Th 1:30-2:20pm. BSB 137

#### **Instructor Office Hours and Contact Information**

**Carol W. Bassim**

IBEHS Office: Michael G.  
DeGroot Centre for Learning  
and Discovery,  
Room 3515

[bassimc@mcmaster.ca](mailto:bassimc@mcmaster.ca)

**Office Hours:**

- Thursday at 12:30-1:20PM (on MS Teams or IBEHS Office)

#### **Instructional Team**

**TAs:**

- Fahad Butt, [butt7@mcmaster.ca](mailto:butt7@mcmaster.ca)
- Evelyn Cudmore, [cudmoree@mcmaster.ca](mailto:cudmoree@mcmaster.ca)
- Varun Jain [jainv8@mcmaster.ca](mailto:jainv8@mcmaster.ca)

#### **Additional Instructional Support**

Couse Teams (McMaster University Office 365) Site for Q&A and other on-line support, if needed; Office Hours Support.

## Course Delivery

[Avenue-to-Learn](#) will be the online management system for the course. Through **Avenue**, you will be able to:

- Find all course materials (lecture slides, lab materials, project documents, etc.)
- View course-related announcements
- Submit course work (assignment, project deliverables) for grading
- View your gradebook

## Materials and Fees

### Textbooks

There is no official course textbook. We will be using material from a previous instructor of engineering statistics: Kevin Dunn's book, Process Improvement using Data. This book is available as a PDF from the <http://learnche.org> website.

Other optional books that will be used to supplement the course material:

1. Montgomery Runger, and Hubele, Engineering Statistics. Engineering Statistics and statistical tools for problem solving.
2. Rosner, Fundamentals of Biostatistics. This is a basic introduction to statistics with human subjects, overviewing statistical practices most often used in the medical literature.
3. Box, Hunter and Hunter: Statistics for Experimenters. This book is recommended for its practical engineering perspectives on data analysis.

### Software

Python will be used as the statistical computing software.

### Hardware

Use of a computer is a requirement in the course.

## Course Objectives and Learning Outcomes (LO)

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

LO.01	Characterize and visualize univariate and bivariate data using descriptive statistics and graphics.
LO.02	Demonstrate an understanding of the basic concepts of random variables, probability distributions, and the sampling distribution of a statistic.
LO.03	Compute and Interpret confidence intervals and significant differences using appropriate hypothesis testing.
LO.04	Understand when and how to use nonparametric hypothesis testing.
LO.05	Fit and interpret a least squares model, and describe the model limitations.
LO.06	Design your own experiment and then interpret experimental data.
LO.07	Use statistical software for statistical computing and analysis of student's t-tests, linear regression, and design of experiments.

## Assessments

The course is assessed as follows.

GRADING MODULE	WEIGHT
<b>Assignments</b>	<b>45%</b>
1	(9%)
2	(9%)
3	(9%)
4	(9%)
5	(9%)
<b>Midterm 1</b>	<b>20%</b>
<b>Midterm 2</b>	<b>20%</b>
<b>DOE Mini-Project</b>	<b>15%</b>

## 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.**

### Submission Penalties

A penalty of 10% per day for up to 2 days will be allowed for late submissions.

## Important Dates

Winter Term	
Monday Jan 9	Winter Classes Begin!
Friday Feb 17	Midterm 1
Monday Feb 20 to Feb 26	Midterm Recess
Friday March 31	Midterm 2
Friday March 7	Good Friday: No Class
Wednesday April 12	End of Term
Wednesday April 19	DOE Mini-project Due

## Communication Policy

If you have a question outside scheduled class hours, email is the best method to contact the instructor or the TAs. Every attempt will be made to reply within 24 hours (excluding weekends). Please include a subject prefix of "IBEHS 4C03". Emails must be sent from your @mcmaster.ca account. Be sure to include your student number in your email.

For a quick question about assignment help, another way to get a response is to message the person directly on MS Teams using the "@" tool. There will also be a Q&A channel that will be monitored on the 4C03 Teams Site.



## 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)
<b>GA01 - Knowledge Base for Engineering</b>	
1.1 – Competence in mathematics	LO.01, LO.02
1.3 – Competence in engineering fundamentals	LO.03, LO.04
1.4 – Competence in specialized engineering knowledge	LO.05
<b>GA05 Use of Engineering Tools</b>	
5.1 – Evaluates engineering tools, identifies their limitations, and selects, adapts, or extends them appropriately	LO.06
5.2 – Successfully uses engineering tools	LO.07

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

## 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 2 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](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), 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](http://www.mcmaster.ca/academicintegrity).

### **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](mailto: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 Observances (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 instructor by 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.

### **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 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.

### **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, A2L 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