1. Schedule

Lectures

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Day</th>
<th>Time</th>
<th>Building/Room*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section D</td>
<td>Tuesday/Thursday</td>
<td>1:05 pm – 2:25 pm</td>
<td>AT 302</td>
</tr>
<tr>
<td>Section E</td>
<td>Tuesday/Thursday</td>
<td>8:35 am - 9:55 am</td>
<td>MC 5050</td>
</tr>
</tbody>
</table>

*Please refer to the [Public Class Schedule](#) for the most recent information

Labs/Tutorials

Lab sessions (tutorials) will be run by teaching assistants (TAs), **starting Week 2 or 3 (to be announced)**. During these sessions, TAs will solve example problems that help you prepare for assignments and exams. At the end of each session, the TA will hold a 1-hour office hour to answer your questions. Attending labs is not mandatory but highly recommended.

2. Course Description

Engineering designs and decisions are often made under uncertainty because engineers do not have the resources (time, money,..) to conduct every experiment and obtain all of the data of interest of the project to support their decisions/designs. Statistics and probability concepts are used to quantify this uncertainty by designing experiments and properly collecting, analyzing and interpreting data in a way that can reduce the risk and improve the reliability in our design and decision making.
3. Intended Learning Outcomes
Upon the completion of this course, you should be able to:
• Describe and calculate common statistical parameters and construct experimental plots
• Explain basic probability concepts and follow continuous probability distributions
• Identify between samples and populations and follow sampling distributions
• Apply statistical and probabilistic analysis to estimate population parameters or test hypotheses about them based on experimental data/samples
• Implement randomized experimental design to collect unbiased and independent samples for data analysis
• Formulate simple linear regression analysis to build empirical models
• Interpret resulting data to obtain objective conclusions and communicate the results effectively

4. Graduate Attributes (GAs)
Engineering programs are accredited by the Canadian Engineering Accreditation Board (CEAB). As part of this process, we collect GA data to assess how effectively we are teaching or conveying the GAs with a goal to continually improve our programs. The GA data are aggregate data for a course and are NOT linked to student names or student numbers. The GAs assessed in this course include the following:

<table>
<thead>
<tr>
<th>GA - Indicator</th>
<th>Assessment Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 - Mathematical skills</td>
<td>Overall assignment grade</td>
</tr>
<tr>
<td>3.1 - Complex problem assessment</td>
<td>Some assignment question(s)</td>
</tr>
<tr>
<td>3.2 - Design of experiments</td>
<td></td>
</tr>
<tr>
<td>3.3 - Experimental procedure</td>
<td></td>
</tr>
<tr>
<td>3.4 - Data reduction methods and results</td>
<td></td>
</tr>
<tr>
<td>3.5 - Interpretation of data (synthesis) and discussion</td>
<td></td>
</tr>
</tbody>
</table>

For information on GAs and continual curriculum improvement, visit the Accreditation section of Engineers Canada website.

5. Accreditation Units

<table>
<thead>
<tr>
<th>Math/Stats</th>
<th>Natural Science</th>
<th>Complementary Studies</th>
<th>Engineering Science</th>
<th>Engineering Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>-</td>
<td>-</td>
<td>50%</td>
<td>-</td>
</tr>
</tbody>
</table>
6. References

**Recommended Textbooks**

**Lecture Notes**
Lecture notes will be posted periodically on Brightspace. The notes are designed to supplement lectures, but do not represent the complete content of the course (for that you should attend the lectures). Some sections of the notes are left blank. We will fill them throughout lectures but filled notes will not be provided. Please be prepared to fill in your notes by hand, tablet, computer, or any approach you find works best for you.
Lectures will not be recorded by the instructor and students do not have permission to record lectures on their own unless it is a part of their PMC accommodation (with required documentation).

7. Topics and Tentative Plan

<table>
<thead>
<tr>
<th>Week* (approximate)</th>
<th>Anticipated Topic*</th>
<th>Assessment*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chapter 1: Exploratory Data Analysis: statistics in engineering, descriptive statistics, graphing experimental data, introduction to population and sampling</td>
<td>-</td>
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<tr>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Chapter 2: Probability Concept and Distribution: basic probability concepts, random variables, probability density function and probability mass function, normal distribution</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Assignment 1 (chapter 1)</td>
<td>Assignment 1 (chapter 1)</td>
</tr>
<tr>
<td>5</td>
<td>Chapter 3: Sampling: sampling design, central limit theorem, sampling distribution of mean (z and t distributions), sampling distribution of variance (chi-square distribution), F distribution, point and interval estimation, confidence interval, sample size</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Assignment 2 (Chapter 2)</td>
<td>Assignment 2 (Chapter 2)</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Chapter 4: Hypothesis Testing: terminology and definitions (null and alternative hypothesis, Type I and Type II error, p-value), degrees of freedom, t-test, chi-square test, F test</td>
<td>Assignment 3 (Chapter 3)</td>
</tr>
<tr>
<td>9</td>
<td>Midterm**</td>
<td>Midterm**</td>
</tr>
<tr>
<td>10</td>
<td>Chapter 5: Basics of Design of Experiments: terminology, randomization, experiments with a single factor, two-factor experiments, ANOVA, introduction to factorial design</td>
<td>Assignment 4 (Chapter 4)</td>
</tr>
<tr>
<td>11</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Chapter 6: Regression Analysis: simple linear egression, diagnostic tests concerning linear regression (correlation, ANOVA, residuals, slope), prediction confidence</td>
<td>Assignment 5 (Chapter 5&amp;6)</td>
</tr>
</tbody>
</table>

* Subject to change  
** Midterm will be between March 7 to 16. Exact date will be decided based on the most popular date determined by survey results.
8. Evaluation and Marking Scheme
Your overall course grade will be determined using the following scheme:

<table>
<thead>
<tr>
<th></th>
<th>Midterm</th>
<th>Assignments (5)</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marks</td>
<td>30%</td>
<td>20%</td>
<td>50%</td>
</tr>
</tbody>
</table>

**Homework Assignments**
To aid your mastery of the course concepts and help prepare you for exams, problems will be assigned as 5 assignments. Marks are awarded for a complete and proper writing of the solution (including units, assumptions, conclusion statements, etc.), not just the right answer.

**Midterm**
Midterm will be held during a lecture time. Exact date will be decided based on the most popular date determined by survey results. It will be an individual closed book test on Chapter 1 to 3. Marks are awarded for a complete and proper writing of the solution, not just the right answer. Using methods/equations that are not covered in class and not included in formula sheet is not acceptable.

**Final Exam**
This course has a two-hour final exam (to be scheduled in final exam period) which will be an individual closed book test on all the chapters. Marks are awarded for a complete and proper writing of the solution, not just the right answer. Using methods/equations that are not covered in class and not included in formula sheet is not acceptable.

**Policies**

a) **Late Submission Policy**
Assignments should be submitted by the due date. If you cannot meet a deadline, please make arrangements with the instructor before the deadline; otherwise a penalty of 10% per day will be deducted from your grade up to 2 days or until the solution set is posted. Late submissions are not accepted after solution set is posted and will result in a grade of zero, unless appropriate documentation is provided.

b) **Missed Term work and Midterm**
Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work or Midterm are held responsible for immediately informing the instructor concerned and for alternate arrangements with the instructor and in all cases this must occur no later than three (3) days after the term work was due or Midterm date. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. Consult Section 4.4 of the University Calendar.

c) **Appeals**
You should bring any grading appeals to your instructor’s attention within 7 days of grades being posted. A brief description of your concern should be submitted in an email to your instructor. Teaching Assistants will not change any marks.

d) **Final Examination**
   i. Final exams are for evaluation purpose and will not be returned to students.
   ii. Students who are unable to write the final examination because of a serious illness/emergency or other circumstance beyond their control may apply for accommodation by contacting the Registrar’s office. Consult the Section 4.3 of the University Calendar.
9. **Academic Dates**
Students should be aware of the academic dates (eg. last day for academic withdrawal) posted on the Registrar’s office web site [https://carleton.ca/registrar/registration/dates/academic-dates/](https://carleton.ca/registrar/registration/dates/academic-dates/)

10. **Academic Integrity and Plagiarism**
   a) Please consult the Faculty of Engineering and Design information page about the Academic Integrity policy and our procedures: [https://carleton.ca/engineering-design/current-students/fed-academic-integrity](https://carleton.ca/engineering-design/current-students/fed-academic-integrity) Violations of the Academic Integrity Policy will result in the assignment of a penalty such as reduced grades, the assignment of an F in a course, a suspension or, expulsion.
   b) One of the main objectives of the Academic Integrity Policy is to ensure that the work you submit is your own. As a result, it is important to write your own solutions when studying and preparing with other students and to avoid plagiarism in your submissions. The University Academic Integrity Policy defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This includes reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source.

Examples of violations of the policy include, but are not limited to:

- any submission prepared in whole or in part, by someone else;
- using another’s data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one’s own; and
- failing to acknowledge sources of information through the use of proper citations when using another’s work and/or failing to use quotations marks.

11. **Course Material Copyright**
The materials (including the course outline and any slides, posted notes, videos, labs, project, assignments, quizzes, exams and solutions) created for this course and posted on this web site are intended for personal use and may not be reproduced or redistributed or posted on any web site without prior written permission from the author(s).

12. **Inclusivity in the classroom**
We will strive to create an environment of mutual respect for all through equity, diversity, and inclusion within this course. The space (virtual) which we work in will be safe for everyone. Please be considerate of everyone’s personal beliefs, choices, and opinions.
13. **Addressing Human Rights Concerns**

The University and all members of the University community share responsibility for ensuring that the University’s educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the **Department of Equity and Inclusive Communities** at equity@carleton.ca.

14. **Academic Accommodations**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Academic Accommodations for Students with Disabilities**: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca.

You should request your academic accommodations in the **Ventus Student Portal**, for each course at the beginning of every term. For in-term tests or midterms, please request accommodations at least two (2) weeks before the first test or midterm. For final exams, the deadlines to request accommodations are published in the **University academic calendars** for both undergraduate and graduate students.

**Accommodation for Student Activities**: Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the **Senate Policy on Accommodation for Student Activities (PDF)**.

**Pregnancy Obligation**: Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the **Student Guide to Academic Accommodation (PDF)**.

**Religious Obligation**: Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please review the **Student Guide to Academic Accommodation (PDF)**.

**Survivors of Sexual Violence**: As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton’s Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit the **Sexual Violence Prevention & Survivor Support**.
15. **Student Mental Health and Wellness**

As a university student you may experience a range of mental health challenges that can significantly impact your academic success and overall well-being. Carleton's [Wellness Services Navigator](https://carleton.ca/health/) is designed to help students connect with mental health and wellness resources.

If you need more information and support with connecting to resources, you are welcome to contact me (shoeleh.shams@carleton.ca, Office: 4242 Mackenzie)

Here is a list of on-campus and off-campus resources:

1. **Carleton’s Health and Counselling Services**: To book an appointment contact the main clinic by calling (613) 520-6674. If urgent, let the Patient Care Coordinator know or go in person to the main clinic (2500 Carleton Technology and Training Centre Building) and indicate that they are in crisis and need to speak to someone right away. For more information, please see [https://carleton.ca/health/](https://carleton.ca/health/)

2. **Emergencies and Crisis** and **Emergency Numbers**

3. **Good2Talk (1-866-925-5454)**: Good2Talk is a free, confidential helpline providing professional counselling and information and referrals for mental health, addictions and well-being to post-secondary students in Ontario, 24/7/36 [https://good2talk.ca/](https://good2talk.ca/)

4. **Empower Me**: Undergraduate students have access to free counselling services in the community through Empower Me, either in person, by telephone, video-counselling or e-counselling. This free service is accessible 24/7, 365 days per year. Call **1-844-741-6389 (toll free)** to make an appointment with a counsellor in the community. More information is available [https://students.carleton.ca/services/empower-me-counselling-services/](https://students.carleton.ca/services/empower-me-counselling-services/)

5. **The Walk-In Counselling Clinic (off-campus community resource)**: The walk-in Counselling Clinic have offices in various locations across Ottawa and the greater Champlain region that are open 7 days a week. Individuals will be assisted, with no appointment, on a first-come, first-serve basis during the Walk-in Counselling Clinic hours. The Walk-in Counselling Clinic offers services in many languages and is free and confidential. More information can be found at: [https://walkincounselling.com/](https://walkincounselling.com/)

6. **Distress Centre of Ottawa and Region**: Available 10am-11pm, 7 days/week, 365 days/year. **Distress Line**: 613-238-3311, **Crisis Line**: 613-722-6914 or 1-866-996-0991, **Text**: 343-306-5550. [https://www.dcottawa.on.ca/](https://www.dcottawa.on.ca/)


8. BounceBack Ontario (Toll-Free: 1-866-345-0224) is a free skill-building program managed by the Canadian Mental Health Association (CMHA). It is designed to help adults and youth 15+ manage low mood, mild to moderate depression and anxiety, stress or worry. Delivered over the phone with a coach and through online videos, you will get access to tools that will support you on your path to mental wellness. [https://bouncebackontario.ca/](https://bouncebackontario.ca/).
16. Special Information for Pandemic Measures

1. It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are a number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you’re sick, washing your hands and maintaining proper respiratory and cough etiquette.

2. Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton’s symptom reporting protocols.

3. Masks: Carleton has paused the COVID-19 Mask Policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

4. Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

5. All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton’s COVID-19 response and health and safety requirements please see the University’s COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.