



## STAT\*3110 Introductory Mathematical Statistics II

Winter 2022

Department of Mathematics and Statistics

Credit Weight: 0.50

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### Course Details

#### Calendar Description

Topics covered in this course include: Estimation, unbiasedness, Cramer-Rao inequality, consistency, sufficiency, method of moments, maximum likelihood estimation; hypothesis testing, Neyman-Pearson lemma, likelihood ratio test, uniformly most powerful test; linear regression and correlation; non-parametric methods.

**Pre-Requisite(s):** STAT\*3100 Introductory Mathematical Statistical I.

**Co-Requisite(s):** none

#### Method of Delivery: Face-to-Face

Winter semester classes will begin as scheduled Jan. 10, 2022; however, classes will be virtually for the first two weeks. Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website.

#### Meeting Information: If classes will be Face-to-Face

Days: Monday, Wednesday and Friday

Time: 10:30AM - 11:20AM

Room: [MINS](#), Room 106

#### Final Exam

There is no final exam in this course.

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## Instructional Support

### Instructor

**Dr. Nagham Mohammad**

Email: [naghamm@uoguelph.ca](mailto:naghamm@uoguelph.ca)

**Office Hours via Zoom:** Please note that further details will be posted in the **Announcements**.

### Teaching Assistant

Chong Gan

Email: [ganc@uoguelph.ca](mailto:ganc@uoguelph.ca)

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## Learning Resources

### Required Textbook

**Title:** John E. Freund's Mathematical Statistics with Applications,

**Author(s):** Miller & Miller.

**Edition / Year:** 8th Ed.

**Publisher:** Pearson Education Canada

### Recommended Textbook

**Title:** Mathematical Statistics with Resampling and R.

**Author(s):** Laura M. Chihara & Tim C. Hesterberg

**Edition / Year:** Second Ed.

**Publisher:** Wiley

### Supplementary Materials (Instructor's Slides)

This course includes supplementary materials, including instructor fillable PowerPoint slides. These materials are meant to supplement the required readings and course content, and to provide study materials for the assignments and Tests. You can print the PowerPoint slides and bring them with you in class (**if classes will be Face-to-Face**). To access these materials, select **Content** on the navbar to locate **Supplementary Materials** in the table of contents panel.

## Course Website

[CourseLink](#) (powered by D2L's Brightspace) is the course website and will act as your classroom. It is recommended that you log in to your course website every day to check for announcements, access course materials, and review the weekly schedule and assignment requirements.

<https://courselink.uoguelph.ca>

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## Learning Outcomes

### Course Learning Outcomes

The objective of this course is to provide students with a solid foundation in mathematical statistics, continuing from STAT\*3100. Students who have successfully completed this course will be expected to:

1. Find the distribution function of a general  $r$ 'th order statistic, minimum statistics and maximum statistics.
2. Find a point estimate based on method of moments, maximum likelihood estimation and Bayesian estimation,
3. Evaluate the performance of a given point estimate based using the 4 criteria: unbiasedness, efficiency, consistency and sufficiency,
4. Find the Cramer Rao lower bound of the variance for unbiased estimators,
5. Determine whether a point estimate is a uniformly minimum variance unbiased estimate (UMVUE),
6. Find confidence intervals for scale and location parameters,
7. Understand basic idea and concepts in hypothesis test, formulate a hypothesis test,
8. Understand the fundamental theory of Neyman-Pearson Lemma, its applications and extensions,
9. Understand the concept of likelihood ratio test,
10. Sketch the power function of a test and from there, compute the type I error and the power,
11. Construct a hypothesis test involving means, variance, and proportions,
12. Perform a  $\chi^2$  test and goodness-of-fit test, and know the connection between them.

### Missed Lectures:

If you miss lectures then you are responsible for finding out what you missed. Your instructor will not reteach missed material.

## Out-of-Class Workload:

As in any university course much of your learning in this course will take place outside of class time. Each week you have 3 hours of lectures. Therefore, you should plan to spend 3-6 hours each week in out-of-class learning. This learning consists mostly of making sure, you understand the concepts and steps that were used in class to solve problems and then solving problems from the **practice problems that I prepared** to you and the **assigned textbook problems** on your own.

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## Assessments

The grade determination for this course is indicated in the following table. A brief description of each assessment is provided below.

**Table 1: Course Assessments**

<b>Assessment Item</b>	<b>Weight</b>	<b>Learning Outcomes</b>	<b>Release Date</b>	<b>Due Date Time: 10:00am</b>
Assignment (1)	*10%	Chapters 1& 2	Thursday, Jan. 20 <sup>th</sup>	Thursday, Jan.27 <sup>th</sup>
<b>Test (1)</b>	<b>**</b>			
Assignment (2)	*10%	Chapter 4	Thursday, Feb. 10 <sup>th</sup>	Thursday, Feb. 17 <sup>th</sup>
Assignment (3)	*10%	Chapter 4	Thursday, Feb. 17 <sup>th</sup>	Thursday March 3 <sup>rd</sup>
<b>Test (2)</b>	<b>**</b>			
<b>Test (3)</b>	<b>**</b>			
Assignment (4)	*10%	Chapters 5 & 6	Thursday March 17 <sup>th</sup>	Monday April 4 <sup>th</sup>
<b>Total</b>	<b>100%</b>			

**\*The lowest assignment will be dropped.**

**\*\*The lowest test will be 10% and the other two tests 60% combined.**

## Assessment Descriptions

### Assignment Policies:

- There will be four (4) assignments during this course.
- In calculating your overall mark, I will throw out your worst assignment grade to account for possible illnesses, computer problems, car accidents, house fires, etc. **If you have extremely serious issues that cause you to miss more than one assignment, talk to me in person.**
- The best three of the four assignments will count equally towards 30% of your grade (1/3 = 10% each).
- No late assignments will be accepted, and late or missed assignments will automatically receive a grade of 0.
- While you are encouraged to discuss approaches to assignment questions with other students, your submitted assignment must be your own work. Copying any part of another student's work is considered academic misconduct. (Please read the section on academic misconduct at the end of this document and in the undergraduate calendar.)
- Assignments will be posted on Courouselink.
- Assignments will be submitted, marked (by TAs), and returned through Crowdmark.

### Test Policies:

- There will be three 50-minits Tests during this course worth 70% of your final grade.
- In order to minimize the impact of a poor performance on any of the 3 tests, I will count 10% for your worst test and 60% combined for the other 2 tests.
- Material to be covered will be announced closer to the Test date on the CoursLink.

**Table 2: Tests Dates**

Test 1	Friday Feb. 11 <sup>th</sup>	10:30 am- 11:20 am.
Test 2	Friday March 11 <sup>th</sup>	10:30 am- 11:20 am.
Test 3	Friday April 1 <sup>st</sup>	10:30 am- 11:20 am.

- **\*Note\* There are no alternate test dates nor make-up.**
- Students must present a valid Student ID card to write all tests.

**\*Note\* If a test is missed for a valid reason, the weight from that test will be carried to the other Tests.**

**Computing:** We will be using the R statistical language. You are not required to be familiar with the software upon entering the course. There are several online tutorials available on the CRAN website to help you in this regard (<http://cran.r-project.org/>). The most recent version of R is also freely available from this site. However, I would provide you with my **prepared introduction to R** and provide further guidance, as needed.

**Guide to using R:** Dalgaard, P. 2008. Introductory Statistics with R, Second Edition. New York, Springer. (pdfs available for free download through University of Guelph library).

**Calculator Policy:** For the tests, only a non-programmable, non-graphical **are allowed.**

**Remarking of Tests:** If you have a question regarding the marking of a test you must first check the posted solutions. If you still have a question, then you should follow the procedure posted on the CourseLink. **You have 3 days to appeal a test grade.**

## University Statements

### Email Communication

As per university regulations, all students are required to check their e-mail account regularly:

e-mail is the official route of communication between the University and its students.

### When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

## **Drop Date**

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester.

This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-regregchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

## **Copies of Out-of-class Assignments**

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## **Accessibility**

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to book their exams at least 14 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website

<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownnc.com/services/accessibilityservices.cfm>

## **Academic Integrity**

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## **Recording of Materials**

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## **Resources**

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>



## **Disclaimer**

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## **Illness**

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

## **Covid-19 Safety Protocols**

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-yoursafe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.