STAT 2120: Probability & Statistics for Engineers

Fall 2019 Course Outline

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Lecture Times & Venue: Monday, Wednesday and Fridays 12:30-01:20 pm in RICH 2520
Office Hour: Wednesday and Thursdays 3:00pm – 4:00pm in office

Graduate Teaching Assistants: Chong Gan; Nishan Mudalige; Glen Reavie & Daiana Spataru
Office Hours: TBA

Note: Regrading requests can only be sent to stat2120@uoguelph.ca. Instructions for submitting a regrade request will be posted on CourseLink. Questions regarding course content or general course questions will not be answered through this email account.

Calendar Description

The topics covered in this course include: Sample spaces; probability, conditional probability and independence; Bayes' theorem; probability distributions; probability densities; algebra of expected values; descriptive statistics; inferences concerning means, variances, and proportions; curve fitting, the method of least squares and correlation. An introduction to quality control and reliability is provided. This course is recommended for students in the B.Eng program.

Prerequisites: One of IPS*1510, MATH*1210, MATH*2080

Restrictions: STAT*2040, STAT*2060, STAT*2080, STAT*2100

Course Aims and Objectives

This introductory course is designed to give you a strong background in basic concepts of probability and statistics including methods of exploratory data analysis and statistical inference. These concepts and methods have important applications to various engineering and scientific disciplines. We will cover several examples related to real life engineering problems.

Specific Learning Objectives: By the end of this course, the student should be able to:

- Construct and interpret graphical displays for simple data sets; calculate and interpret measures for the centre and spread of data.

- Compute the probability of various events using Venn diagrams, tree diagrams, and the addition and multiplication rules.
- Describe the concepts of mutually exclusive events, conditional probability, dependent and independent events, and Bayes theorem.
- Discuss the concepts of random variables, probability distributions, expected value and variance and identify their use in developing statistical inference tools.
- Describe the properties discrete and continuous probability distributions including the normal and t-distributions.
- Describe the concept of a sampling distribution and its use in conducting statistical inference for population parameters.
- Calculate and interpret confidence intervals and hypothesis tests involving population means, proportions and variance. Conduct a Chi-Square test of independence.
- Explain the concept of P-values in hypothesis testing.
- Conduct a hypothesis test for equality of multiple means using the ANOVA procedure.
- Calculate and interpret correlation coefficient and regression line equations; conduct statistical inference for a simple linear regression model.
- Employ statistical inference tools for quality control and reliability assessment.

Course Materials

Required Textbook: 9th edition of Probability & Statistics for Engineers & Scientists by Walpole, Myers, Myers and Ye. A hard copy of the text is on reserve in the McLaughlin Library Reserve Collection.

Optional: Student Solutions Manual

Lecture Notes: Incomplete notes will be posted on CourseLink throughout the course. The notes will rely heavily on the textbook and topics will be covered in the order presented in the book. If you are absent from a class for any reason, you need to get in touch with a class colleague to complete the notes you missed. I strongly recommended that you attend every class.

Textbook Exercises: A list of relevant textbook exercises for each chapter will be posted throughout the course. Completing these exercises will help you practice for assignments, midterm and final exams.

CourseLink: Course information and materials (such as assignments, lecture notes, grades, etc.) will be available on STAT*2120 CourseLink website.

Learning Centre: Drop-in help is available in the Statistics Learning Centre) for students seeking help with course content and/or assignments (https://mathstat.uoguelph.ca/tutoring; Science Commons, 3rd floor of the library).

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Lecture Content and Important Dates

Weekly Lectures	Topics and Book References	Notes
Self-study	Introduction and Descriptive Statistics	n/a
Week 0-1	Probability	n/a
Week 2	Discrete Probability Distributions	n/a
Week 3	Continuous Probability Distributions	**Assignment** 1* Due Friday Sep. 27
Week 4-5	Sampling Distributions	**In-class Test** Friday Oct. 4
Week 5-6	Inferences Concerning a Mean	n/a
Week 6-7	Two-Sample Inference Procedures for Means	**Assignment 2** Due Friday Oct. 18
Week 7-8	Inference for One and Two Proportions	**Midterm** Friday Oct. 25
Week 8-9	Inference for One and Two Variances	n/a
Week 9-10	Analysis of Variance (ANOVA)	**In-class Test** Friday Nov. 8
Week 10-11	Introduction to Linear Regression	**In-class Test** Wednesday Nov. 20
Week 12	Inference for Linear Regression Model	**Assignment 3** Due Friday Nov. 29

* All assignments are due by 11:59 pm on the due date.

Midterm and Final Exam

Midterm: Friday, October 25th, 2019; 6:00pm-7:30pm (1.5 hours to write)
Location: RICH 2520

Final Exam: Saturday, December 7th, 2019; 7:00pm-9:00pm (2 hours to write)
Location: TBA

Other Important Dates

Friday, September 6, 2019: First day of Stat* 2120 lectures
Monday, October 14, 2019: Holiday--NO CLASSES SCHEDULED -- classes rescheduled to Friday, November 29.
Friday, November 29, 2019: Last day of lectures; Last day to drop one-semester courses.

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Course Assessments and Polices

The following Grading scheme will be used to determine your grade:

Assignments: 10%; Best 2 out of 3 assignments
In-class Tests: 10%; Best 2 out of 3 tests
Small In-class Quizzes: 5%
Midterm: 25%
Final Exam: 50%

Important Note: You must receive at least 50% of the marks available, in total, on the in-class tests, midterm, and final exam that are used to calculate your *final grade*. That is,

(Total marks earned on all tests and exams) ÷ (Total marks available on all tests and exams) ≥ 50%

If you do not achieve this, your maximum possible final grade will be 48%, no matter what grade you receive on the Assignment component. Considerations may be made according to the policies listed below.

Grading Policies

Assignments: Assignments will be posted on CourseLink before the lecture on the Monday preceding the due date. No late assignments will be accepted, and late or missed assignments will receive a grade of 0 automatically. All assignments will be submitted through the Crowdmark system; and will be marked by TAs and returned through Crowdmark when appropriate. Therefore, queries on assignments should be presented to Tas (stat2120@uoguelph.ca). If you are unable to submit an assignment with a valid reason (appropriate documentation is needed, e.g, doctor note for the illness), then, your mark will be based on the remaining assignments. You are expected to complete the assignments yourself and to submit your own work. See below for the University of Guelph policies on Academic Misconduct.

Small In-class Quizzes: These quizzes will be administered via CourseLink and will take place in most of the lectures comprising 1 or 2 questions each time. You can access your CourseLink webpage using your personal mobile device (e.g. smartphone, tablet, laptop). Questions will have 1 mark each with the following breakdown: 0.5 for attempting a question and 0.5 for the correct answer. Regardless of the reason, missed quizzes will receive a grade of 0 automatically. In order to accommodate situations where you are unable to attend the class for a valid reason, bottom 20% of your quiz responses will be dropped from evaluation of your final grade. You should note that you can achieve 2.5% of the total grade credit by simply participating in these *in-class* quizzes.

Tests and Midterm: Missed in-class tests or midterm will receive a grade of 0, unless they are missed due to a valid documented reason (see University Policies below), in which case the weight of the missed test will be added to the midterm (for Test 1) or the final exam (for the Midterm, and Test 2 & 3).

There will be no makeup tests or midterm. Should you miss the midterm for an academic reason with appropriate proof, while the weight will be shifted to the final exam, **your final exam will be cumulative** and will cover the **entire course syllabus**.

Passing grade: You need to meet the following two requirements to pass the course.

i) You must obtain a *final grade* of 50% or higher.
ii) You must receive at least 50% of the marks available, in total, on the in-class tests, midterm, and final exam that are used to calculate your *final grade*. See "Important Note" above more details.

Communication Policies: Preferred method of communication is in-person or by email. For email communication, you must use your University of Guelph email account. Use STAT*2120 in your subject line, and include your name and student ID number in all correspondence. Emails that do not include a name and ID number, or from non-uoguelph accounts, will not be answered. Please note that only administrative inquiries will be answered via email (nadeemk@uoguelph.ca); questions regarding assignments, course content, etc. will only be answered during office hours or in lecture.

University Policies

Academic Consideration: If you are unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, ID number, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor at the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08accomrelig.shtml

Academic Misconduct: 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 discourages misconduct. 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. The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Accessibility: The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible. For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/

Course Evaluation Information: The Mathematics and Statistics evaluation can be performed on-line through the CCS course evaluation website: https://courseeval.uoguelph.ca/CEVAL_LOGIN.php

Course 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 Veteri- nary 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-reg-regchg.shtml
Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08
-drop.shtml

Recording of Materials: Presentations which are made in relation to course work—including lectures— cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate 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 which apply to undergraduate, graduate and diploma programs.

Mental Health Services: One out of every five students in Canada experiences some sort of mental health issue at some point in their academic career. If you find yourself facing a mental health crisis, or

just need to talk to someone, please consider taking advantage of one of the following resources available to University of Guelph students:

Counseling Services: (x53244) is located at Health Services (J.T. Powell Building) and offers individual and group counselling sessions by appointment or walk-in.
Student Support Network: is located in Raithby House (across from the cannon and offers confidential, peer-based, drop-in support.
Good2Talk: (1-866-925-5454) is a free, 24/7 student hotline that provides professional counselling and referrals for mental health, addictions and well-being.
Here 24/7: (1-844-437-3247) specializes in assessment, referral and appointment booking and is available 24/7 for crisis support.

You are not alone and you will not be judged for asking for help.