STAT 2120: Probability & Statistics for Engineers

Fall 2020 Course Outline

Instructor: Khurram Nadeem, PhD
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Email: nadeemk@uoguelph.ca
Lecture Times: Monday, Wednesday and Fridays 12:30-1:20 pm
Delivery Mode: **Online lectures** delivered synchronously via **Zoom**
Office Hour: Wednesdays 3:00pm – 4:00 pm via Zoom

Graduate Teaching Assistants: Ahmad Naser, Mayada Elkhalifa and Xiangyu Ruan.
Office Hours (Zoom): TBA

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.

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

Lecture Materials: Complete lecture slides 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.

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 project.

Learning Centre: TBD

Communication: Questions regarding assignments, course content, etc. will be answered during the office-hours. If you wish to communicate via email (nadeemk@uoguelph.ca) for other inquiries, please 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. If you have a question regarding course structure, such as grading policies, please **read this course outline carefully** before contacting via email.

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.

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Course Assessment & Policies

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

Grade Item	Weight	Assessment Technology
Weekly Quizzes	10%	CourseLink – Quizzes
Five Assignments	45%	Crowdmark
Midterm	20%	Crowdmark
Final Project	25%	CourseLink – Dropbox with Turnitin

Grading Policies

Assignments: Each assignment will be posted on CourseLink in two parts according to the following schedule:

Part-1: Posted on Wednesdays (pm) preceding the due date.
Part-2: Posted on Mondays (am) preceding the due date.

No late assignments will be accepted, and late or missed assignments will receive **a grade of 0** automatically. Any queries on assignments should be presented to TAs (stat2120@uoguelph.ca). If you are unable to submit an assignment with a valid reason, then, your mark will be **based on the remaining assignments**. You are expected to complete the assignments yourself and **must** submit your own work. See below for the University of Guelph policies on Academic Misconduct.

Weekly Quizzes: These quizzes will be administered via CourseLink. Regardless of the reason, missed quizzes will receive a **grade of 0** automatically. In order to accommodate situations where you are unable complete a quiz for a valid reason, your lowest two quiz scores will be dropped from evaluation of your final grade.

Midterm: Missed midterm will receive a **grade of 0**, unless it is missed due to a valid reason (see University Policies below), in which case its weight will be transferred to the Final Project. There will be no makeup midterm exam.

***Final Project*:** This project will consist of a typed-in report (word or pdf format) submitted to a CourseLink Dropbox folder and the **Turnitin** feature will be enabled to assess originality of your work.

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Lecture Content and Important Dates

Weekly Lectures	Topics	Notes
Week 0-1	Introduction; Probability	Self-Study: Descriptive Statistics
Week 2-3	Random Variables and Probability Distributions	
Week 4-5	Special Discrete and Continuous Probability Distributions	**Assignment 1*** Wednesday Sep. 30
Week 5-6	Sampling Distributions; Inferences Concerning a Mean	**Assignment** 2 Wednesday Oct. 14
Week 6-7	Two-Sample Inference Procedures for Means	**Midterm** Friday Oct. 23
Week 7-8	Inference for One and Two Proportions	
Week 8-9	Inference for One and Two Variances	**Assignment 3** Wednesday Nov. 4
Week 9-10	Analysis of Variance (ANOVA)	
Week 10-11	Introduction to Linear Regression	**Assignment 4** Wednesday Nov. 18
Week 12	Inference for Linear Regression Model	**Assignment 5** Wednesday Dec. 2

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

Other Important Dates

Friday, September 11, 2020: First day of Stat* 2120 lectures
Monday, October 12, 2020: Holiday--NO CLASSES SCHEDULED -- classes rescheduled to Friday, December 4.
Friday, December 4, 2020: Last day of lectures; Last day to drop one-semester courses.

Disclaimer

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 https://news.uoguelph.ca/2019-novel-coronavirus-information/

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University Policies

Academic Consideration: The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.

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/

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

Recording of Lecture Materials: By enrolling in a course, unless explicitly stated and brought forward to their instructor, it is assumed that students agree to the possibility of being recorded during lecture, seminar or other "live" course activities, whether delivery is in-class or online/remote.
If a student prefers not to be distinguishable during a recording, they may:

1. turn off their camera
2. mute their microphone
3. edit their name (e.g., initials only) upon entry to each session
4. use the chat function to pose questions.

Students who express to their instructor that they, or a reference to their name or person, do not wish to be recorded may discuss possible alternatives or accommodations with their instructor.

Online Behaviour

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students
- Using obscene or offensive language online
- Copying or presenting someone else's work as your own
- Adapting information from the Internet without using proper citations or references
- Buying or selling term papers or assignments
- Posting or selling course materials to course notes websites
- Having someone else complete your quiz or completing a quiz for/with another student
- Stating false claims about lost quiz answers or other assignment submissions
- Threatening or harassing a student or instructor online

- Discriminating against fellow students, instructors and/or TAs
- Using the course website to promote profit-driven products or services
- Attempting to compromise the security or functionality of the learning management system
- Sharing your username and password
- Recording lectures without the permission of the instructor

Other 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.