STAT*2120

Probability & Statistics For Engineers

Fall 2016

UNIVERSITY of GUELPH

(Revision 0: August 17, 2016)

1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Kimberly M. Herder, Ph.D.

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Email: klevere@uoguelph.ca

Office hours: Monday 10:00am-11:00am in Richards 2525
                Wednesday 12:00pm-1:00pm in Richards 2525

1.2 Teaching Assistants
TBA

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the STAT*2120 Courselink website. You are responsible for keeping up-to-date on this site.

2.2 Required Resources

The course manual *STAT*2120 – Probability & Statistics For Engineers - Course Manual*, is available at the MacNaughton Bookstore. This is the primary resource for the course and will be completed in class as the course progresses. Please be sure that you have the current version (only available in the MacNaughton bookstore) as a number of changes have been made to last year's manual.

2.3 (Strongly) Recommended Resources

The *STAT*2120 For You To Try Manual* is also available at the MacNaughton Bookstore. In response to the request for "more questions written by Kim" in course evaluations, I have constructed a manual of questions (with final answers) that have all be written by me! They are separated by section so that you can follow along with the material in class. Since I don't require a textbook, I strongly recommend this resource for practice questions.

2.4 Additional Resources

Probability and Statistics for Engineers, Miller & Freund

Lecture Information:

It is strongly recommended that you attend every class. We will complete the course manual together during lectures so please bring it to every class. **Due to low attendance in the past as well as copyright issues, I will NOT be posting my completed notes online.**

2.5 Communication & Email Policy

Please use office hours and Courselink discussion forums as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its student.

3 ASSESSMENT

3.1 Dates and Distribution

Your grade will be determined using the following grading scheme:

Grading Scheme
4 in-class Quizzes 20%
Midterm 30%
Project 10% **
Final Exam 40%

**You must receive at least 50% of the marks available, in total, on the quizzes, midtem and final exam. That is,

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

If you do not achieve this, your maximum possible final grade will be 48%, *no matter what grade you receive on the Project components*. Otherwise your grade will be calculated according to the grading scheme in the table above. Considerations may be made according to the policies listed in Section 3.2.

In-class Quizzes: Quizzes will be worth 5% each will cover approximately 2-3 weeks of lecture material. Quizzes will be short, independent, 20 minute assessments that will test your understanding of current topics in the course. To help you to practice and prepare, I have constructed a For You To Try Manual with similar-spirited questions. Here is the schedule of dates:

Quiz 1: Wednesday, September 21st, 2016.

Quiz 2: Wednesday, October 5th, 2016.

Quiz 3: Wednesday, November 2nd, 2016.

Quiz 4: Wednesday, November 16th, 2016.

Midterm and Final Exam:

Midterm: Friday, October 28th, 2016, 5:30pm-7:00pm
Location: Richards 2520

Final Exam: Thursday, December 5th, 2016, 7:00pm-9:00pm.
Location: TBA.

Project: due Wednesday, November 23rd, 2016 by NOON to the Crowdmark system.

> The project for this course will lay out a scenario and ask you to apply your knowledge of statistics to investigate a problem. You should draw on as many topics from the course as you can, justifying your statistical choices at every step. You may also wish to include mock data in order to conduct statistical tests. In week 9 you will be randomly assigned to a group of 4 to 5 other students with whom you will complete this project. The list of groups will be posted on Courselink at this time.

3.2   Course Grading Policies

Academic Consideration: When you find yourself 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: http://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/c08-accomrelig.shtml

Missed midterm tests: Missed quizzes or midterms will receive a grade of 0%, unless they are missed due to any of the above reasons, in which case the weight of the missed test or quiz will be added to the final exam. There will be no makeup midterm or quizzes.

Passing grade: In order to pass the course, you must receive a final grade of at least **50%**. Additionally, in order to pass this course, you must receive at least 50% of the marks available, in total, on the quizzes, midterm and final exam. If you do not achieve this, your maximum possible final grade will be 48%.

4   AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1   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.Engg program.

Credit Weight: 0.5   **Department:** Mathematics & Statistics   **Campus:** Guelph

Prerequisite: 1 of IPS*1510, MATH*1210, MATH*2080

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

4.2   Course Aims

This course is an introductory course in probability and Statistics. The objective of the course is to give you a strong statistical background that you will require as you progress through your degree and beyond. The main goals of the course are (1) to teach students the concepts listed in section 4.1 at a level that promotes a deep understanding and (2) to explain how such concepts are applicable in their various degrees by exploring real-world problems.

4.3   Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Calculate and analyze basic descriptive statistics.

2. Compute the probability of simple and compound events.

3. Comprehend the notions of random variables, probability distributions, expected value and variance and use them to develop statistical methods.

4. Be comfortable with well-known discrete probability distributions and calculating associated probabilities.

5. Master the normal and t-distributions, be aware of their shapes and properties and how to calculate associated probabilities.

6. Comprehend the notion of a sampling distribution and know the sampling distribution of the sample mean, and sample variance under various circumstances.

7. Construct a confidence interval and carry out a hypothesis test on a mean or difference of means.

8. Interpret confidence intervals and hypothesis tests and use them to make statistical decisions.

9. Understand and calculate the power of a test and the notions of Type I and Type II errors.

10. Construct a confidence interval and carry out a hypothesis test on a proportion.

11. Be able to conduct a hypothesis test (or construct a confidence interval) for count data.

12. Construct a confidence interval and carry out a hypothesis test on a variance or difference of variances.

13. Understand the connections and calculations in an ANOVA table.

14. Conduct hypothesis tests a confidence intervals concerning the slope of a regression line.

15. Have a basic understanding of how statistics can be used in risk and reliability assessment.

4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1-15	Quizzes, FYTT problems, Exams, Project
2. Problem Analysis	1-15	Quizzes, FYTT problems, Exams, Project
3. Investigation	1-15	Quizzes, FYTT problems, Exams, Project
4. Design	-	-
5. Use of Engineering Tools	-	-
6. Communication	-	Quizzes, FYTT problems, Exams, Project
7. Individual and Teamwork	1-15	Quizzes, FYTT problems, Exams, Project
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	-	-
10. Ethics and Equity	-	-
11. Environment, Society, Business, & Project Management	-	-
12. Life-Long Learning	-	-

4.5   Instructor's Role and Responsibility to Students

As your instructor, I must:

1. Develop and deliver course material in a professional way that facilitates learning for a variety of students and learning styles;

2. Attend all lectures, filling in the course notes as we proceed in each lecture. I will provide completed course notes online regularly, but I strongly urge you to come to class.

3. Respond to you. This includes, as time permits, questions in lectures, after classes, during office hours, or through email (where I reserve the right to reply within a timeframe of 1-2 days). You are more than welcome to contact me at any time through these means if you have questions or concerns about the course or the course material.

4. Evaluate you fairly, and fairly as compared to your peers, providing prompt feedback on your performance and justification for your grade. I must provide academic consideration, where appropriate, as described in Section 3.

4.6   Students' Learning Responsibilities

As a member of this class, you are expected to:

1. Take advantage of the learning opportunities provided during lectures and on assignments;

2. Treat others with respect and dignity whenever you address them, in-class or online.

3. Genuinely attempt assignment questions, and complete an appropriate number of practice problems from the textbook in a timely manner, including assignments, on your own time;

4. Seek help if you have tried the assignment questions and/or textbook exercises and are still having difficulty with the course content. This means contacting me (*not* just at the last minute!) and possibly considering other resources as I recommend them to you;

5. Check all grades against tests that have been returned to you, once they are posted to the Course website, to verify that the correct mark has been recorded.

6. Notify me, as described in Section 3, in the case that there are missed tests or academic conflicts that are known in advance. If illness, work, or extra-curricular activities are causing you to struggle, you are advised to keep us up-to-date on your progress, so that I can be more helpful to you.

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures (Dr. Herder (Levere)):

Monday	8:30 am – 9:20 am	MACN*105
Wednesday	8:30 am – 9:20 am	MACN*105
Friday	8:30 am – 9:20 am	MACN*105

5.2 Lecture Schedule

(schedule is approximate and subject to change depending on time constraints)

Lectures (Week)	Lecture Topics	References
0-1	Probability	Chapter 3
2	Discrete Probability Distributions	Chapter 4
3	Continuous Probability Distributions	Chapter 5
4	Sampling Distributions	Chapter 6
5	Inferences Concerning a Mean	Chapter 7
6	Two-Sample Inference Procedures for Means	Chapter 8
7	Inference Procedures for Proportion(s)	Chapter 9
8	Inference Procedures for Variance(s)	Chapter 10
9	Analysis of Variance	Chapter 11
10-11	Introduction to Linear Regression	Chapter 12
12	Catch-up	Chapter 13

5.3 Lab Schedule

Not applicable.

5.4 Other Important Dates

First day of classes: Thursday, September 8, 2016
Thanksgiving: Monday, October 10th, 2016 (no classes)
Fall Study Break Day: Tuesday, October 11th, 2016 (no classes)
Thursday, December 1, 2016 (runs as a TUESDAY in lieu of Fall Study Break Day)
Friday, December 2, 2016 (runs as a MONDAY in lieu of Thanksgiving)
Last day of classes: Friday, December 2nd, 2016.

Drop Date: The last date to drop one-semester courses, without academic penalty, is Friday, November 4th, 2016. Two-semester courses must be dropped by the last day of the add period in the second semester. Refer to the Graduate Calendar for the schedule of dates:
http://www.uoguelph.ca/registrar/calendars/graduate/current/sched/sched-dates-f10.shtml

Course Evaluation Information: Near the end of the term, you will be given the opportunity to evaluate your instructor and provide comments regarding your experience. The evaluations for this class will be done in-class. Your instructor will inform you of when these are to take place.

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6   LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

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7   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.

7.1   Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

8   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 for a short-term disability should contact Student Accessibility Services, SAS, (formerly, the Centre for Students with Disabilities) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.csd.uoguelph.ca/csd/

9   RECORDING OF MATERIALS

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

10 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.
http://www.uoguelph.ca/registrar/calendars/index.cfm?index