The University of Western Ontario
Department of Statistical and Actuarial Sciences
STATISTICAL SCIENCE 2141 – Fall 2018
Applied Probability and Statistics for Engineers

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Office Hours: Mondays, Wednesdays and Fridays, 10:30 AM-12:00 PM, WSC 107
Lecture Hours: Mondays, Wednesdays and Fridays, 1:30 PM-2:30 PM, NSC 1
Tutorial Hours: Wednesdays, 5:30 PM-6:30 PM, SSC 2050

Prerequisite(s)
Applied Mathematics 1413, or either Calculus 1000A/B or 1100A/B plus either Calculus 1301A/B or 1501A/B. Applied Mathematics 1413 (026), or either Calculus 1000A/B. or 1100A/B (050a/b) plus either Calculus 1301A/B (051a/b) or 1501A/B (081a/b).

Anti-requisite(s)
All other courses or half courses in Introductory Statistics except Statistical Sciences 1023A/B, Statistical Sciences 1024A/B. All other courses or half courses in Introductory Statistics except Statistical Sciences 1023A/B, Statistical Sciences 1024A/B.

Students are advised that they are responsible to ensure that they possess the necessary prerequisites (or have written special permission) and that de-registration may occur at any time if they lack the prerequisite or have taken an anti-requisite course.

Text Book
- Probability and Statistics for Engineers and Scientists, 4th ed., by Anthony Hayter.

Reference Book
- Probability and Statistics for Engineering and the Sciences, 9th ed., by Jay Devore

Course Description
An introduction to statistics with emphasis on the applied probability models used in Electrical and Civil Engineering and elsewhere. Topics covered include samples, probability, probability distributions, estimation (including comparison of means), correlation and regression. Cannot be taken for credit in any 3-year or honors program or in any module in Statistics, Actuarial Science, or Financial Modelling.

Course Objectives
At the end of the course, students should be able to:
- state fundamental concepts of applied probability and statistics,
- see how the concepts are related and interact with each other,
- decide where and under what circumstances a given concept is applicable,
- combine the concepts to produce solutions for real-life problems,
- make appropriate inferences and decisions.

Course Outline

Chapter	Topics
6 – Descriptive Statistics	Graphing Data, Sample Statistics: Mean, median, Variance, IQR, Percentiles, Outliers
1 – Probability Theory	Probabilities, Events, Union, Intersection, Conditional Probability, Bayes Rule
2 – Random Variables	Discrete and Continuous Random Variables, Expectation, Variance, Combinations, Functions of Random Variables
3 – Discrete Probability Distributions	Binomial, Geometric, Negative Binomial, Poisson
4 – Continuous Probability Distributions	Uniform; Exponential; Gamma
5 – Normal Distributions	Normal Curve Calculation, Linear Combinations, Normal Approximation to Binomial, Related Distributions
7 – Statistical Estimation and Sampling Distributions	Point estimates and their properties, sampling distributions and construction of parameter estimates
8 – Inference About a Population Mean	One Sample Hypothesis Testing and Confidence Intervals (variance known/unknown)
9 – Inference About Two Population Means	Two Sample Hypothesis Testing and Confidence Intervals (independent and paired samples)
12 – Simple Linear Regression and Correlation	Regression, Inferences About Slope, Prediction Intervals, Coefficient of Determination, Residual Analysis, Correlation Analysis
16 – Quality Control Methods	

Course OWL Web Page

The web page will contain:

1. A copy of this course outline
2. Updates and information about the course that you need to know
3. Daily class notes (which will be incomplete – to be filled in during the classes) and other things that are relevant to the course
4. Marks of quizzes and tests as they are marked

In-class Clickers

Your clicker use will be recorded in each lecture and will become part of your record. As such, your clicker record will be afforded the same degree of security, confidentiality and transparency that is customary for test marks, etc.

Clicker questions will be asked during most (but perhaps not all) lectures. You need only to answer 80% of the total clicker questions asked during the entire course to obtain a 5 (out of 5) on the clicker portion of your final mark. For any percentage (y) less than 80%, your clicker mark will decrease linearly using the formula:

$$\text{Clicker mark} = 6.25(y)$$

Examples: If you only answer 68% of all clicker questions, clicker mark = 6.25(0.68) = 4.25 (out of 5). If you only answer 44% of all clicker questions, clicker mark = 6.67(0.44) = 2.75.

Clicker participation only requires that you try; you do not have to get the questions correct to get this part of your course grade. Notice that you can miss up to 20% of the clicker questions (for any reason) without affecting your grade; this 'buffer' accounts for any technical problems that may arise as well as days on which you forgot your clicker or were late for class/left early. **Please note that no accommodation will be made for missed clicker participation or incorrectly programmed clicker IDs**.

Your clicker data will not be used for any non-academic or research purpose without your consent. For any research study in which you are invited to participate, you will be provided with a Letter of Information with an opportunity to give or withhold consent. Such research will not replace the usual end of term Course Evaluation given by the University.

Quizzes

There will be several multiple choice questions asked during tutorials that you will be required to answer using clickers. The following guidelines will apply:

- **Only 80% of the quiz questions will count toward your final mark.** (So you can miss 20% of the questions for any reason and you do not need any medical documentation. There are no makeup questions.)
- Each quiz question will be out of 5. You will receive full marks for each question you answer correctly and 1 out of 5 marks for each question you do not answer correctly. No marks will be given for questions you do not answer.
- You will be allowed to review your notes and collaborate with others in the class to come up with your answers.
- There will be a trial period to make sure that your clicker works.

Midterm Exams (1 hour each)

There will be 2 one-hour tests (consisting of short answer and multiple-choice questions) scheduled on the following dates:

1. Exam 1: **Wednesday**, **October 17, 2018, 5:30 pm to 6:30 pm** (Topics TBA)
2. Exam 2: **Wednesday, November 14, 2018, 5:30 pm to 6:30 pm** (Topics TBA)

If you have any conflict, you must check with your instructor as soon as possible (and prior to the exam). If you miss the test for a valid reason, you must provide proof as to why you missed the test. There are no makeup tests. The weight of the missed test will be moved to the final exam.

Final Exam

The final exam will be a three-hour examination covering all material in the course, with emphasis on material covered since the midterm. The exam will consist of short answer and multiple-choice questions. It will be scheduled by the Registrar's office. Do not make travel arrangements until you know your exam schedule. Holding an airline ticket is not an acceptable reason to miss the final exam.

Cellular phones, iPods, and other similar technology are *not* permitted in the exam room. This means that cellular phones, iPods and other similar technology **cannot** be used as a timekeeper/clock, calculator or for any other purpose.

You will need a non-programmable calculator for all exams/in-class quizzes.

Evaluation

	Option 1	Option 2	Option 3
Clickers	5%	5%	5%
Quizzes	10%	10%	10%
Mid Term 1	17.5%	10%	20%
Mid Term 2	17.5%	20%	10%
Final Exam	50%	55%	55%

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** The marking scheme that gives the higher final mark will be the one used. This will be done automatically. No other marking schemes will be considered!

Policy on e-mail communication

You are welcome to communicate with your instructor by e-mail, but e-mail communication should only be used to provide them with information or to ask a question that requires a brief response. For more lengthy discussions and for discussions on lectures/course material please see your instructor during their scheduled office hours or by appointment. If you do e-mail them, please use your UWO account, as these are often the only emails read (as e-mails sent from other addresses often get spammed).

Attendance

The Department of Statistical and Actuarial Sciences views classroom attendance as a very important part of the learning process. You are expected to attend all classes. You are advised that excessive absenteeism may result in being debarred from the final examination.

Classroom Environment

The Department of Statistical and Actuarial Sciences has adopted a "Mutual Expectations" policy governing the classroom environment and all work submitted by students. [The full text of the policy can be found on the Statistical and Actuarial Science departmental web page, www.uwo.ca/stats, by clicking on the "Undergraduate" section]. In summary, all interactions between students and faculty should be governed by the principles of **courtesy, respect and honesty.**

Students are encouraged to ask questions in the class. Cell phones should be turned off before class/during class and any unnecessarily loud talking among students is discouraged. The goal is to reduce any behaviour by students that may disrupt other students

Department Policy on Missed Course Requirements and Student Health and Wellness

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is your responsibility to make alternative arrangements with your instructor once the accommodation has been approved and the instructor has been informed.

For Final Exam: In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

For Midterm Exam: The policy of the Department of Statistical and Actuarial Sciences is that there will be no make-up exams for a missed midterm. For those that do legitimately miss a midterm and provide the required supporting documentation, the standard practice will be that the weight of the midterm will be reassigned to the final exam. If your reason is not deemed valid, then you will receive a mark of 0.

For in-class clickers: There are NO makeups for any of the clicker questions or quizzes, so if you miss 20% of the questions, they will be the ones that will not count towards your final mark. If you have already missed 20% of the questions, each additional question missed will count as a mark of ZERO. You do not need to get in contact with your Faculty or your instructor if you miss a question.

If you require academic accommodation due to illness, you should use the Student Medical Certificate when visiting an off-campus medical facility. The form can be found here: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Or, request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services.

Academic Policy

In accordance with policy, http://www.uwo.ca/its/identity/activatenonstudent.html, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at this website: http://
www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Computer-marked, multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Support Services

Learning-skills counsellors at the Student Development Centre are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling: http://www.sdc.uwo.ca

Students who are in emotional/mental distress should refer to Mental Health@Western for a complete list of options about how to obtain help: http://www.health.uwo.ca/mental_welbeing

Additional student-run support services are offered by the USC: http://westernusc.ca/services.

The website for Registrarial Services: http://www.registrar.uwo.ca

Accessibility
Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

The policy on Accommodation for Students with Disabilities can be found here:
www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf

The policy on Accommodation for Religious Holidays can be found here:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

***APPROXIMATE* Weekly Course Calendar**

Lectures – 2018	**Section**	
Sep 5 - 14	Descriptive stats, Probability theory (sections 6.1 - 6.4, 1.1 - 1.2)	
Sep 17 - 21	Probability theory (sections 1.2 – 1.5)	
Sep 24 - 28	Probability theory, Random variables (sections 1.5 – 1.7, 2.1 - 2.2)	
Oct 1 - 5	Random variables (sections 2.2 – 2.4, 2.6)	
Midterm Exam 1 – Wednesday, Oct 17, 5:30- 6:30 pm (1 hour) – Chapters/Sections TBA		
Oct 15 - 19	Random variables, Discrete probability distributions, Continuous probability distributions (sections 2.6, 3.1 – 3.2, 3.4, 4.1 – 4.2)	
Oct 22 - 26	Continuous probability distributions, Normal distribution (sections 4.2 – 4.3, 5.1 – 5.3)	
Oct 29 – Nov 2	Normal distribution, Statistical estimation and sampling distributions (sections 5.3 – 5.4, 7.1 – 7.3)	
Nov 5 - 9	Statistical estimation and sampling distributions, Inferences about a population mean (sections 7.3 – 7.4, 8.1 – 8.2)	
Midterm Exam 2 – Wednesday, Nov 14, 5:30- 6:30 pm (1 hour) – Chapters/Sections TBA		
Nov 12 - 16	Inferences about a population mean (sections 8.2 - 8.3)	
Nov 19 - 23	Inferences about two population means (sections 9.1 – 9.4)	
Nov 26 - 30	Simple linear regression and correlation (sections 12.1 – 12.5)	
Dec 3 - 7	Simple linear regression and correlation, Quality control methods (sections 12.5 – 12.9, 16.1 – 16.3)	
Final Exam – To be scheduled by the Registrar's office (3 hours)		