



Intermediate Probability 2017/2018

[Statistical Science 3657A Section 001](#)

Course Outline

Instructor Information

Instructor	David Stanford
Office	WSC 211
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Phone	519-661-3612 ext 83612
Office Hours	Tue 2:30 p.m.-3:30 p.m.; Wed 1 p.m.-3 p.m.;

Course Information

Course Description	A continuation of the study of multivariate probability and stochastic processes. This course builds on the background developed in the second year courses, and focuses on the more advanced aspects of multivariate probability, namely transformations where the domain of random variables must be carefully considered.
Prerequisites	SS2858A/B A minimum mark of 60% in Statistical Sciences 2858A/B and in Applied Mathematics 2503A/B or Calculus 2503A/B.
Pre,Co-requisites	Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. You can be deregistered at any time even after writing the final exam. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites
Warning	
Lecture Hours	Mon,Wed,Fri 11:30 AM-12:30 PM B&GS 165;
Tutorial Hours	Wed 5:30 PM-6:30 PM WSC 55
Course Website	For now, and probably for the whole term, http://www.stats.uwo.ca/modules/undergraduate/section_page.php?section_id=581

Book Information

Text Book(s)

J. A. Rice, Mathematical Statistics and Data Analysis, third edition.

Course Objectives

This course provides a thorough treatment of the *concepts of probability, properties of random variables, conditional expectation and transformations*. Just as important as the results that are obtained are the *means* by which they are obtained. Someone who excels in the course will become as adept at carrying out the techniques as in understanding *why* they are needed.

Most of the topics we cover were covered in Statistical Sciences 2857A, so the number of new topics introduced is relatively small. The course will introduce conditional expectation. Moment-generating



functions will be introduced and used widely. Other new topics will occur. However, students will be expected to *fully understand*, and to be *able to explain* in clear English *why* the subject material is needed, and *where* things can be applied. Students will also be able to master certain mathematical techniques which they will be expected to be able to use in courses which either have SS36576A as a direct prerequisite, or else because it is a prerequisite for SS3858B next term, which is also a prerequisite for a large number of courses in Statistics and in Actuarial Sciences.

To illustrate, some topics are needed for the development of statistical theory and actuarial topics such as risk theory and loss functions. The course will make use of the prerequisites of first and second year calculus, basic algebra and linear algebra and the prerequisite statistics courses. The student is expected to review these topics as needed. Basic properties of functions will be used, such as: monotone, 1 to 1 mappings, many to 1 mappings, invertible noninvertible. Curve sketching from first year calculus will be used. The change of variables theorem for integrals will be used. The student should be familiar with not just the conclusion, but also the conditions or hypotheses of these tools. Computer work, mainly using R will be used in the lectures and assignments from time to time to illustrate and implement some of the topics. However MatLab or other software may be used if needed, but the student should speak to me about this.

One main objective of the course is for the student to **master the tools and methods** for finding distributions of functions of random variables (r.v.'s), understand joint distributions and related topics, some basic limit theorems or approximations in probability and statistics. Another is to **gain an appreciation** for *why* these techniques are needed. The last objective is to **know and fully understand certain key results** underlying the core of statistical theory (for instance, the Law of Large Numbers and the Central Limit Theorem). **The tools and techniques used are as important as the results, and the emphasis of the course is on the methodology.** Exams will be graded accordingly, with the majority of marks for methods and a smaller amount for the answer.

In order to master these skills, students will have to work hard at understanding the *why* behind material presented in class, and to *become adept* at applying the tools (rather than merely memorizing scores of examples and hoping that one of them applies, without understanding why it works).

Classroom engagement will be encouraged, with 8% of the final grade being allocated to two mechanisms to facilitate this. Five percent will come from clicker responses taken in class and during the tutorial, and three percent from direct participation in class. More explanation for this follows below.

The lecture notes will contain some additional comments on doing assignments and some alternative texts.

Assessment

Assignments and/or Quizzes

There will be four or five assignments during the semester, due about every two weeks:

Assignments need to be dropped into the Assigned dropbox for this course no later than 11:25 am on the due date, unless the instructions indicate otherwise. They will be cleared at that time, five minutes prior to the start of the lecture.

Midterms or Tests

There will be two one-hour term tests, held during the tutorial time at WSC 55, starting at 5:30 p.m, on



Wednesday October 4th, 2017; and Wednesday November 9th, 2017.

There will be no make-up exam for one missed midterm test. Such students will see the missing weight distributed in proportion to the other test and the final exam, so long as the Dean's Office approves the student's absence from the test. A student missing **both** tests will be required to sit for a special exam covering the material of both midterms. This will be set at a mutually agreeable time for student and instructor between the 2nd midterm and the final exam period.

Final Exam

The date and time will be announced by the registrar's office, usually near the first part of November. Do **NOT** schedule December travel before the confirmed exam schedule is posted. Having purchased a ticket for a flight during the exam period is **NOT** an acceptable reason for writing the January bulk makeup exam; only illness and other severe situations deemed appropriate by the Dean's office are.

Evaluation

Your grade comprises:

- 7% for assignments
- 5% for clicker responses
- 3% for direct participation in class or in office hours
- 35% for two midterm tests (17.5% of each)
- 50% for the final exam.

Course Website Information

For now and probably for the whole term, the website is http://www.stats.uwo.ca/modules/under...n_page.php?section_id=581

Clicker Scoring

Five percent of your grade will come from clicker responses. A student will receive five marks if they respond coherently to 85% of the posed questions or more. So long as it is a coherent response, it does not matter if the answer was right or wrong. **The 85% threshold is established to cover all instances of clicker / phone / tablet / laptop malfunction or absence due to illness. As such, no further adjustment will be made for such undesirable events.** Anyone having less than an 85% response rate will receive less than five marks, in direct proportion to the amount of answers that were provided. For instance, someone answering 68% of questions coherently will receive $5 * (68/85) = 4$ marks.

In the event that a student misses an extended consecutive period of classes (in excess of a week), please see me.

Direct Participation Scoring

Three percent of your grade will come from direct participation to questions asked in class. A count will be made of all contributions that I deem useful by all students. The student answering the most will get three marks. All other students will receive an amount in proportion to the logarithm of the counts. Everyone is given a bonus count of one, so that the logarithm can be calculated for everyone. To illustrate, if the most active student makes 25 useful contributions over the course of the term, then someone providing five useful contributions would earn $3 * \ln(5) / \ln(25) = 3/2$.



The log scale encourages everyone to participate, as successive useful contributions earn less and less.

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 your Dean's office as soon as possible, and contact your instructor immediately. If accommodation is approved by your Dean's office, your instructor will be notified, then it is your responsibility to make alternative arrangements with your instructor. 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: http://www.stats.uwo.ca/accommodation_medical.pdf. A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility. The form can be found at: <http://www.stats.uwo.ca/medicalform.pdf>. Or, request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services.

Missed Midterm or Test: 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.

Student Health and Wellness: As part of a successful student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western's Campus Recreation Centre. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page <http://www.music.uwo.ca/>, and our own McIntosh Gallery <http://www.mcintoshgallery.ca>. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html.

To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.

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.

Support Services: Learning-skills counsellors at the Student Development Centre (SDC) (<http://www.sdc.uwo.ca>) 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.

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

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

Email Communication

Email communication should only be used to provide me 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 email them, please use your UWO account, as these are often the only emails read (as emails sent from other addresses often get spammed).

Attendance

Classroom attendance is viewed as an important part of the learning process. Students are advised that excessive absenteeism may result in the student being disbarred from the final exam (see Western Academic Calendar).

Classroom Environment

The Department 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 at: http://www.stats.uwo.ca/mutual_expectations.pdf. In summary, the policy was developed under the premise that all interactions between students and faculty should be governed by the principles of courtesy, respect and honesty.