STAT 2000 Section A03
Basic Statistical Analysis 2
Winter 2017

Time	T/R 10:00 a.m. – 11:15 a.m.
Location	204 Armes
CRN	50087

Instructor	You Liang
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Web Pages	UM Learn: `http://umanitoba.ca/umlearn`
	Statistics: `http://umanitoba.ca/statistics`
	Gradebook: `http://www.stats.umanitoba.ca/gradebook`

Office Hours:	Monday 13:30 p.m. – 14:30 p.m.
	Tuesday 13:30 p.m. – 14:30 p.m.
	Thursday 13:30 p.m. – 14:30 p.m.

If the above times are not convenient for you, please call, email or speak to me to arrange an alternate time to meet. I will do my best to return all email or telephone messages within 24 hours.

Calendar Description

(Formerly 005.200) The study of estimation and hypothesis testing procedures for means and proportions in one, two, and multiple sample situations, introduction to the analysis of variance; regression and correlation analysis; optional topics may include nonparametric procedures, design of experiments, probability models. Not to be held with STAT 2001. Prerequisite: STAT 1000 (005.100)(C), or STAT 1001(C).

Teaching Philosophy and Goals

It is the desire of the Department of Statistics to present this course in a manner that emphasizes and illustrates the statistical analysis arising from "real-world" applications. Whenever possible, we will attempt to bring real-life examples and data into the classroom. Upon completion of this course students can proceed in many directions: to further intensive study of statistics, to one or more additional courses in statistics, to the use of statistical methods in other fields of study, or to being a consumer of statistical information in daily life. It is our objective to serve all of these diverse directions. It should be noted that this is a 2000 level course. As such, a certain level of maturity is expected.

The course is designed to include basic topics deemed crucial for problem formulation and understanding of the foundations of statistical thinking and reasoning. The concepts of statistical analysis will be stressed. The course will place an emphasis on the development of critical thinking skills.

Software will be used in this course to aid in the analysis of data. The computer program that has been selected for this course, Microsoft Excel, is easy to use and is available free for use with Mac or Windows systems. The program also has many advanced statistical features that you will find useful in subsequent courses.

We are interested in feedback from you. If you can think of ways in which this course could be improved, please let us know.

Evaluation

i►clicker Questions/Participation	5%
Quizzes	10%
Midterm Test	35%
Final Examination	50%

Marks for i►clicker sessions, quizzes and the midterm test will be posted on the gradebook (see the web link on Page 1).

Subject to the caveat in the paragraph below, the following are the minimum percentage grades required to receive each of the various letter grades: A$^+$ (90%), A (80%), B$^+$ (75%), B (70%), C$^+$ (65%), C (60%), D (50%).

There is an **additional requirement** for obtaining a C in the course: **to obtain a grade of C or better, you must obtain at least 50% on the final examination**.

Exam Information

The midterm test will be held **Wednesday March 15, 2017 from 5:30 p.m.– 7:30 p.m.**. The material to be covered on the midterm will be announced in class. The final exam will be 3 hours in duration and will be scheduled by the Student Records Office. The final exam will cover Units 1 – 6, with emphasis on the material covered after the midterm. Students missing the midterm test for a valid reason (and with documentation) will be permitted to write a deferred midterm test at a later date.

The midterm will consist of only multiple-choice questions. The final examination will contain both multiple-choice questions and a written component, in an approximate 70:30 ratio.

For quizzes, the midterm test and the final examination: (i) nonprogrammable handheld calculators are permitted (graphing calculators are **not** permitted), (ii) electronic devices, such as cell phones or headphones, are prohibited, (iii) statistical tables will be provided, if required, and (iv) a formula sheet with selected formulas will be provided (for the midterm test and final examination only).

i▸clickers

Throughout the course, extensive use of the i▸clicker classroom response system will be made in order to enhance your understanding of the material and promote classroom participation. Note that i▸clicker participation constitutes a portion of your grade in this course and as such you are required to bring your i▸clicker to each class and to ensure that it has functional batteries.

For every i▸clicker response you give, you will be awarded 1 point. For questions with a correct answer, an additional point will be awarded for selecting the correct response. Full marks (5/5) will be given if you receive at least 75% of the total possible i▸clicker points. Partial marks (3/5) will be given if you receive between 50% and 75%. No marks (0/5) will be given if you receive less than 50%.

The use of another student's i▸clicker constitutes impersonation and is strictly forbidden under the University of Manitoba's academic dishonesty policy. (See page 4.)

Please register your i▸clicker at `https://www.stats.umanitoba.ca/register/iclicker`. You will need to enter the 8-character i▸clicker ID found on the back of your remote.

Quizzes

There will be three quizzes over the course of the term. The instructor will inform students of the material covered on each quiz at least one week in advance. The quizzes will be given in class on the following dates: February 7, March 7 and April 11.

Quizzes account for 10% of your final grade. Your percentage grade for quizzes will be calculated using the **best two of three quiz marks**. Quizzes must be written in your own section. They will be graded within one week and marks will be posted on UMLearn. There will be no make-up quizzes.

Assignments

There will be no formal assignments in this course. However, numerous practice problems (with solutions) will be posted for each unit. Students are strongly encouraged to try these practice problems on a regular basis.

Software Download

The latest version of Microsoft Excel (2016) can be downloaded to your computer by logging into your university email at `http://365.myumanitoba.ca`, clicking on the gear icon ⚙ in the top right corner, and then selecting Office 365. On the webpage that opens in a new tab, click on Software in the Settings group and follow the instructions from there.

Supplementary Resources

The following books are recommended for reading and extra practice. They are available for download free of charge.

- Introductory Statistics, OpenStax College, Rice University (2013)
  `http://www.stats.umanitoba.ca/book/intro-stats/`

- Basic Statistics, Rand R. Wilcox, Oxford University Press (2009)
  `http://www.stats.umanitoba.ca/book/basic-stats/`

Note that these textbooks are provided for extra reference and practice only. Coverage and notation may differ somewhat from the course notes. (Notes may cover topics that are not covered in the textbooks or vice-versa.) **Where there are any discrepancies between the way topics are covered in the course notes and in the textbook, please refer to the course notes**.

Statistics Help Centre

In room 311 Machray Hall (which contains a number of computers), graduate students and senior undergraduate students in statistics are available to help you at the following times (from January 23 to April 21):

Monday	9:30 a.m. – 4:30 p.m.
Tuesday	9:30 a.m. – 7:00 p.m.
Wednesday	9:30 a.m. – 7:00 p.m.
Thursday	9:30 a.m. – 4:30 p.m.
Friday	9:30 a.m. – 12:00 p.m.

Note: The lab will be closed on holidays and during the midterm break (Feb 21 – 24).

Voluntary Withdrawal

The voluntary withdrawal date is **March 31** (by which time you will have received your marks for the first three quizzes, the midterm test and several i►clicker sessions).

Academic Dishonesty

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation, as well as typical penalties) can be found at:

`http://umanitoba.ca/science/undergrad/resources/webdisciplinedocuments.html`

Copyrighted Material

All course notes, assignments, tests, exams, practice exams and solutions are the intellectual property of your instructor or the Department of Statistics. Reproduction or distribution of these materials is strictly forbidden without their consent.

Recording of Class Lectures

Your instructor and the University of Manitoba hold copyright over the course materials, presentations and lectures which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission from your instructor.

Use of Electronics in the Classroom

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. A student may use technology in the classroom setting only for educational purposes approved by the instructor and/or the University of Manitoba Accessibility Services. Students should not engage in electronic messaging/posting activities (e-mail, texting, video or voice chat, social networking (e.g. Facebook)) or electronic gaming during scheduled class time.

Class Communication

The University requires all students to activate an official University email account. Please note that all communication between your instructor and you as a student must comply with the Electronic Communication with Students Policy. Please see

`http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html`

You are required to obtain and use your U of M email account for all communication between yourself and the university.

Student Accessibility Services

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

`http://umanitoba.ca/student/saa/accessibility/`

ROASS Schedule A

Schedule A of the Responsibilities of Academic Staff with regards to Students (ROASS) policies of the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. Schedule A will be posted on your instructor's UMLearn page.

Course Outline

Unit 1 – Inference for the Mean of a Single Population when σ is Known; Inference for the Mean of a Single Population when σ is Not Known

- Review of principles of statistical inference: testing and estimation, confidence intervals
- Statistical decisions: Type I and Type II errors and their probabilities, power of a test
- Review of t distribution (comparison with normal distribution), tests and confidence intervals, robustness of t procedures

Unit 2 – Inference for the Means of Two Populations

- Matched pairs t procedures
- Inference for the equality of means in two populations when population variances are equal and when population variances are unequal, assumptions of normality and independence

Unit 3 – Inference for the Means of Two or More Populations

- Graphical comparison of distributions
- Inference for the equality of means in two or more populations: introduction to ANOVA
- The F-distribution
- Equivalence of pooled 2 - sample t-test and F-test

Unit 4 – Probability and Discrete Distributions

- Review of probability concepts and rules
- Conditional probability
- Random variables, probability distributions, mean and variance of a random variable
- Mean and variance of the sum and difference of two independent random variables

- Distribution of the sum and difference of two independent normal random variables
- Review of binomial distribution
- Poisson distribution

Unit 5 – Analysis of Categorical Data and Goodness-of-Fit Tests

- Inference for a population proportion
- Power calculations
- Inference for comparing two population proportions
- Inference for $(r \times c)$ two-way tables: tests of independence and homogeneity of proportions, chi-square test, expected values, degrees of freedom
- Equivalence of Z-test and Chi-square test
- Goodness-of-fit tests
- Binomial goodness-of-fit test

Unit 6 – Regression and Correlation

- Inference in simple linear regression (slope, confidence intervals, prediction intervals
- Analysis of residuals and use of diagnostic tools
- Correlation: inference, correlation vs. regression
- Equivalence of testing for zero correlation and testing for zero slope
- Multiple regression