STAT 1000 Section D01
Basic Statistical Analysis 1
Winter 2017

CRN 51177

Instructor Ankit Doshi
323 Machray Hall
Telephone: 204-474-8205
Email: Ankit.Doshi@umanitoba.ca

Web Pages UM Learn: `http://umanitoba.ca/umlearn`
Statistics: `http://umanitoba.ca/statistics`

Office Hours: Monday 5:30 p.m. – 6:30 p.m.: in-person or via Skype (username doshistats)
Wednesday 10:30 a.m. – 12:00 p.m.
Friday 10:30 a.m. – 12:00 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 005.100) An introduction to the basic principles of statistics and procedures used for data analysis. Topics to be covered include: gathering data, displaying and summarizing data, examining relationships between variables, sampling distributions, estimation and significance tests, inference for means. Not to be held with STAT 1001, STAT 2220 (005.222). Prerequisite: Any grade 12 or 40S Mathematics, or equivalent.

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.

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

Assignments	15%
Midterm Test	35%
Final Examination	50%

Marks will be posted on UM Learn (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

For students who live within 2 hours of Winnipeg, the midterm test will be held **Saturday March 18, 2017 from 9:30 a.m.– 11:30 a.m.** All other students will write their midterm online with more information forthcoming. The midterm will cover Units 1 – 5 in the course outline. 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 – 11, with emphasis on Units 6 – 11. 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 60:40 ratio.

For 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.

Assignments and Practice Questions

There will be 3 assignments in this course, which students will access via UM Learn. The due dates are Wednesday February 8, Wednesday March 8, and Wednesday April 5. Assignments submitted past the due date will not be accepted.

Numerous practice questions (with solutions) will be posted for each unit. Students are strongly encouraged to try these practice questions 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 (February 21-24).

Voluntary Withdrawal

The voluntary withdrawal date is **March 31** (by which time you will have received your marks for the first two assignments and the midterm test.

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.

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 – Examining Distributions

- types of variables: quantitative, categorical, nominal, ordinal
- graphs for categorical variables: bar charts, pie charts
- graphs for quantitative variables: stemplots, histograms
- examining distributions, dealing with outliers
- time plots
- describing distributions with numbers: mean, weighted mean, median, quartiles, percentiles, interquartile range, range, variance and standard deviation
- five-number summary and boxplots
- the $1.5 \times$ IQR rule for suspected outliers, outlier boxplots
- resistant measures

Unit 2 – Scatterplots, Correlation and Regression

- association, response variable, explanatory variable
- examining scatterplots
- correlation
- least-squares criterion and least squares regression line
- r^2
- residuals, outliers, influential observations
- cautions about correlation and regression
- association vs. causation, lurking variables
- extrapolation

Unit 3 – Sampling Design

- populations and samples
- voluntary response sample
- convenience sample
- simple random sample
- census
- stratified random sample, multistage sample
- undercoverage, nonresponse

Unit 4 – Design of Experiments

- observations vs. experiment
- experimental units
- factors, factor levels, treatments
- placebo effect, control group, bias
- principles of experimental design
- completely randomized design
- randomized block design
- matched pairs design

Unit 5 – Density Curves and Normal Distributions

- continuous random variables, density curves
- normal distributions
- 68–95–99.7 rule
- standardizing observations (z-scores)
- normal distribution calculations
- normal quantile plots

The midterm test covers material in Units 1 – 5.
The test is on **Saturday March 18, 2017**
from 9:30 a.m. – 11:30 a.m.

Unit 6 – Randomness and Probability

- randomness, the language of probability
- probability models, sample space, events, unions, intersections
- some probability rules, independence, general addition rule
- discrete random variables
- binomial setting and binomial distribution

Unit 7 – Sampling Distributions

- sampling distribution of a sample mean
- bias and variability
- Central Limit Theorem
- sampling distributions for proportions

Unit 8 – Confidence Intervals for a Population Mean (σ known)

- estimating with confidence
- margin of error
- effect of sample size, confidence level, standard deviation
- effect of population size
- assumptions
- choosing the sample size

Unit 9 – Tests of Significance

- tests for a population mean (σ known)
- hypotheses, test statistic, P-value, statistical significance
- two-sided tests and confidence intervals

Unit 10 – Inference for One Population Mean (σ unknown)

- one-sample t procedures — confidence intervals and tests
- robustness of the t procedures

Unit 11 – Inference for a Population Proportion

- confidence intervals and tests for a population proportion
- choosing the sample size

Final Examination covers material in Units 1 – 11, with emphasis on Units 6 – 11.
The exam is 3 hours in duration and will be scheduled by the Student Records Office.
