

Arts and Science 2R03 – Applied Statistical Inference 2021 Winter Term

Instructor: Dr. David Lozinski | **E-mail:** lozinski@math.mcmaster.ca | **Tel. Extension:** 23409 | **Office:** HH 315

Office hours: Tu, Fr 1:30-2:20 | **Web Page:** The course web page can be found on Avenue to Learn

Lectures: Tu, We, Fr 12:30 – 1:20 | **T01:** Tu 2:30-3:20 | **T02:** Tu 3:30-4:20

Teaching Assistants: Quinn Macpherson (macpherq@mcmaster.ca) & Abigail Mazurek (mazureka@mcmaster.ca)

Please Note: The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of students to check their McMaster email and course websites weekly during the term and to note any changes.

Announcements will be made in class, on the course web site, and by using the course email distribution list.

COURSE DESCRIPTION

Inferential statistics, with an emphasis on applications. Topics include data description, graphical methods, probability, confidence intervals, hypothesis testing, one-way ANOVA, and analysis of categorical data. The course includes the use of the statistics software package R.

COURSE AND LEARNING OBJECTIVES

Introduction:

The course objectives are to learn, exemplify and train the students on: (a) methods to summarize data numerically and graphically, (b) the most widely used statistical methods to draw inferences from observed data, (c) some of the mathematical details behind the methods, and (d) handling data and carrying out basic statistical analyses using the freeware statistical package R.

REQUIRED MATERIALS/ RESOURCES

Textbook:

- *Introductory Statistics - A Problem-Solving Approach* by Stephen Kokoska, published by Macmillan Education. It is available at the Campus Store.

Supporting problems are listed on the web site. Answers to selected problems are in the back of the textbook.

Calculator: Only the standard Casio fx 991 MS or MS Plus calculator is permitted.

VIRTUAL COURSE DELIVERY

To follow and participate in virtual classes it is expected that you have reliable access to the following:

- A computer that meets performance requirements [found here](#).
- An internet connection that is fast enough to stream video.
- Computer accessories that enable class participation, such as a microphone, speakers and webcam when needed.

If you think that you will not be able to meet these requirements, please contact uts@mcmaster.ca as soon as you can. Please visit the [Technology Resources for Students page](#) for detailed requirements. If you use assistive technology or believe that our platforms might be a barrier to participating, please contact [Student Accessibility Services](#), sas@mcmaster.ca, for support.

COURSE OVERVIEW AND ASSESSMENT

Lectures:

Lectures will be virtual. They will be livestreamed using Zoom during the scheduled class period three times a week. Additional videos may be provided for required viewing between lecture times. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, usernames for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Assignments:

There will be 5 assignments to be completed during the term. Assignments will make use of the statistical software R. R is freeware statistical software downloadable for Windows and MacIntosh platforms from The R Project for Statistical Computing. The web page is:

<http://www.r-project.org/>

The assignments will be due by noon on the Wednesdays of:

Feb 3, Feb 24, March 10, March 24, and April 7.

Late assignments will not be accepted and a grade of zero will be assigned.

Participation:

A portion of the final grade will be computed based on participation in collaborative learning activities done during the tutorials.

Project:

In addition to the above, a project consisting of a statistical analysis of appropriate data will be required. The project due date is Tuesday, April 13.

More information on the project will be presented in class.

Mid-Term Tests:

There are 2 midterm tests, each worth 20% of the final grade. The dates for the midterms are tentatively Wednesday, February 10 during class time (12:30-1:20pm)
 Wednesday, March 17 during class time (12:30-1:20pm)
 More information, including the topics covered, will be announced in class.

Final Exam: A 2.5-hour final exam will be administered remotely online using remote proctoring software. It will cover all course material.

EVALUATION

Assessment	Weight
1. Two Midterm Tests	40% (20% each)
2. Final Examination	30%
3. Assignments	15% (3% each)
4. Project	10%
5. Participation	5%

The assignments will be due by noon on the Wednesdays of: Feb 3, Feb 24, March 10, March 24, and April 7. The dates for the midterms are tentatively Wednesday, February 10 and Wednesday, March 17 during class time. The project will be due on Tuesday, April 13.

SENATE-APPROVED ADVISORY STATEMENTS

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>.

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., online search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use online elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses online elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities](#) (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact [Student Accessibility Services](#) (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's [Academic Accommodation of Students with Disabilities](#) policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](#) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the

Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

NOTES FOR ALL ARTS & SCIENCE COURSES

1. Some of the statements above refer to a "Faculty Office"; please note that the Arts & Science Program Office serves in this capacity.
2. It is the responsibility of students to check their McMaster email regularly. Announcements will be made in class, via A2L, and/or via the course email distribution list <d-as2R03@mcmaster.ca>.

Approximate lecture schedule

Week 1: Jan 11 to Jan 15

- Intro, graphing data, Intro to R
- Chapters 1 and 2

Week 2: Jan 18 to Jan 22

- Measured statistics (including mean, percentiles, variance and std dev)
- Chapters 2 and 3

Week 3: Jan 25 to Jan 29

- Probability, from counts of equally likely outcomes, 3 axioms and basic laws
- Chapter 4

Week 4: Feb 1 to Feb 5

- Independence, conditional probability, discrete probability distributions
- Chapter 4

Week 5: Feb 8 to Feb 12

- Baye's Formula, Binomial and Poisson distributions
- Chapters 4 and 5

TEST 1

READING WEEK: Feb 15 to Feb 19

Week 6: Feb 22 to Feb 26

- Continuous Random variable, PDFs, normal distribution, exponential
- Chapter 6

Week 7: March 1 to March 5

- parameters from sample, dist of statistic, C.I. and t distribution
- Chapter 8

Week 8: March 8 to March 12

- Dist of sample proportion and C.I., C.I. for variance and Chi square
- Chapter 8

Week 9: March 15 to March 19

- Hypothesis testing, null alternative, test statistic, decision rule, error types
- Chapter 9

TEST 2

Week 10: March 22 to March 26

- Examples, 1 tail, 2 tail, Hypothesis testing on proportion, 2 sample means
- Chapters 9 and 10

Week 11: March 29 to April 2

- 2 sample means, examples. Categorical data, contingency tables
- Chapters 10 and 13

Week 12: April 5 to April 9

- Chi square test, test for homogeneity, intro to ANOVA
- Chapters 13 and 11

Week 13: April 12 to end of term

- Review.