Department of Mathematics & Statistics

Stat 311

Modern Statistical Methods

Winter 2023

Professor Information

Professor:	Claude Hurtubise
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Office Hours:	TBA

Section Information

Section:	001		
Class Times:	Tue	9:30 - 10:50	C234
	Thu	9:30 - 10:50	C234
Lab Time:	Tue	14:00 - 15:50	A145
	Thu	14:00 - 15:50	B112

Calendar Description

Stat 311-3-3
Modern Statistical Methods
In this course, learners study hypothesis, testing, bootstrap, jackknife, permutation tests, additive models, robust smoothers, m-estimators, rank-based methods, nonparametric methods, and unsupervised methods. (3,2,0)

Prerequisites:

- Completed or concurrently registered in STAT 310.

Transfer Information

Please refer to the transfer guide, available online at http://www.bctransferguide.ca. Students are encouraged to save a copy of current transfer information for their own records.

Course Materials

The required text for this course is:

Gareth James et al., **An Introduction to Statistical Learning - With Applications in R, 1st Edition**
Springer, 2013, ISBN: #978-1-4614-7137-0

Claude Hurtubise, **Course Notes**

Course Content

Chapter 2: Introduction

X.0 Statistical Learning, Nonparametric Statistics, Robust Statistics
2.2 Assessing Model Accuracy

Chapter 3 : Linear Regression

3.2 Multiple Linear Regression - Review
3.3 Other Considerations in the Regression Model

Generalized Linear Models

X.1 Introduction
X.2 Probit and Logit Models
X.3 Poisson Models
X.4 Models with Continuous and Skewed Data

Robust Regression - Selected Topics

X.5 Quantile Regression
X.6 M-Estimation
X.7 Rank-Based Methods

Chapter 4: Classification

4.1 An Overview of Classification
4.2 Why Not Linear Regression
4.3 Linear Discriminant Analysis
4.3 A Comparison of Classification Models

Chapter 5: Resampling Methods

5.1 Jackknife and Cross-Validation
5.2 The Bootstrap
X.5 Permutation Tests

Chapter 6: Linear Model Selection and Regularization

6.1 Subset Selection
6.2 Shrinkage Models
6.3 Dimension Reduction Methods
6.4 Considerations for High Dimensions

Chapter 7: Moving Beyond Linearity

7.1 Polynomial Regression
7.2 Step Functions
7.3 Basis Functions
7.4 Regression Splines
7.5 Smoothing Splines
7.6 Local Regression
7.7 Generalized Additive Models
7.8 Non-linear Modeling

Course Evaluation

Your grade in this course will be broken down as follows:

Lab	40%
Quizzes	25%
Final Exam	35%
Total	100%

- **Labs**: Labs will be given (roughly) weekly. They will be located on the Lab Moodle Course page where details and instructions will be posted. There are two portions to the lab:
  - The first hour will consists of the previous labs presentation. Every student will take a turn presenting throughout the semester. Students will participate in the feedback.
  - The second hour will consists of instructions and examples.
- **Quizzes**: Instead of term tests, you will be given (roughly) weekly quizzes on each topic or chapter.
- **The final exam**: will be **cumulative** and held during the final exam period as scheduled by the registrar's office. The format will be announced before the exam is administered.

Online Examination Policy

Some students may be selected for individual follow-up interviews after examination. Such students will be contacted via email after the examination and will be requested to participate in a short interview about their conduct during the examination and how they arrived at specific answers they submitted. Any student whose activities during the exam attracted particular attention or suspicion from their invigilator will be more likely to be requested to participate in a post-exam interview.

Department Policies

- All written assignments are due at the start of class. All assignments not handed in within the first five minutes of class will be assigned a grade of zero.
- The math department does not give make-up exams nor does the department allow students to write exams out of time without a valid medical or compassionate reason.
- It is expected the student attends all classes. If a student misses a class, it is the student's responsibility to get the material covered in class from their peers.
- No students may change sections of a course after the final add/drop date. If students wish to switch sections after the first day of class but before the final add/drop date, they should consult the chair of the Math department in order to not lose grade progress.
- Failure to achieve a grade of at least 45% on the final exam of a course will result in a failing grade for the course.
- When a student fails a course as a result of failing to achieve a final exam grade of 45%, the maximum grade that will be awarded is 49%.
- Calculators used for exams will satisfy the department's calculator policy. For Stat 311, students are allowed a non-programmable, non-graphing scientific calculator.
- A formula sheet will be provided for this course.
- The final exam for this course shall be cumulative.

Okanagan College Policies

Final Exam Policy: The procedures relating to final exams are significantly different than those that involve midterms. Final exam policy is determined by the college and a much more formal process is invoked should a student be unable to write the final exam. It is stated in the final exam policy that student travel plans are not a valid reason for writing an out-of-time final exam. As such, it is essential that you do not make travel plans prior to the final exam schedule being posted. The full final exam policy can be found at the following link.

http://webapps-5.okanagan.bc.ca/ok/Calendar/Examinations

The final exam schedule is determined by the Office of the Registrar and posted at the following link sometime around the middle of the semester.

https://www.okanagan.bc.ca/office-of-the-registrar/scheduling-office/scheduling-office#finalexam

Academic Integrity Policy: Okanagan College requires that all students are informed of the Academic Integrity Policy included in the College Calendar which can be found at the following link:

http://webapps-5.okanagan.bc.ca/ok/Calendar/AcademicIntegrity

College Student Conduct Policies: Okanagan College requires that students are informed of acceptable Student Conduct Policies included in the College Calendar which can be found at the following link:

http://webapps-5.okanagan.bc.ca/ok/Calendar/StudentConduct

Student Advising & Counselling

Accessibility Services collaborates with the academic departments of the college to arrange appropriate accomodation for students with a disability. If you require academic accomodation, please contact disability services. Contact, and other relevant information, can be found at:

https://www.okanagan.bc.ca/accessibility-services

Counselling Services has professionally trained staff that are available to assist students in coping with problem areas in their life (including: personal & career counselling, study skills) that interfere with maximizing their academic and social potential. For more information visit:

http://www.okanagan.bc.ca/counselling-services