

**Faculty of Science Course Syllabus
Department of Mathematics and Statistics
Data Analysis — STAT 5620
Fall 2017**

Instructor(s): Hong Gu hgu@dal.ca
Lectures: Meet with students 2 hours per week, time TBA
Laboratories: None
Tutorials: None

Course Description

This course will begin with an introduction to both linear models and generalized linear models (GLM). Emphasis will be placed on the understanding of both the underlying statistical theory and method implementation. Additive and generalized additive models (GAM) will then be introduced followed by their mixed model extensions. Real and relevant data sets will be used throughout the course to both demonstrate and validate the various analysis tools. The R programming language will be used exclusively. Each student will have the opportunity to select a dataset of interest to them and use this for various aspects of the assignments and the course project. Finally students will be required to present both their project proposal and results.

Course Prerequisites

STAT 3340, STAT 3460, and the instructors consent.

Course Objectives/Learning Outcomes

The course objectives are to provide graduate students with i) working knowledge of a diverse range of statistical methodologies and ii) confidence to utilize these methodologies where appropriate in order to answer scientific questions of interest.

Specific learning outcomes:

- The capacity to recognize important features of data (heterogeneity, repeated measurements, distribution of the response variable etc.).
- A thorough understanding of linear models, additive models and their extensions.

- A thorough understanding of generalized linear models, generalized additive models and their extensions.
- A full comprehension of the concepts of zero-inflation, zero-truncation and over- and under-dispersion.
- A working knowledge of hierarchical modelling frameworks and a grasp of random effects.
- An understanding of tree based methods.
- An appreciation for the field of Spatial Statistics.
- A working knowledge of the R language and environment for statistical computing and graphics including a solid grasp of the statistical techniques connected to this course.

Course Materials

Reference Textbooks: “Generalized Additive Models: An Introduction with R.” by Simon Wood.
 ”Generalized, Linear, and Mixed Models”, by Charles McCulloch and Shayle Searle.
 ”Extending the Linear Model with R”, by Julian Faraway.

Course Assessment

As a reading course for two graduate students, two students will take turns to present the material for two hours each week. Each student will make oral presentation 6 times in total during the term. There will be 3 assignments and one project as part of the assessment.

Component	Weight (% of final grade)	Date
Oral presentations	50	
Project	35	December 15
Assignments	15	3 assignments

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+	(90–100)	B+	(77–79)	C+	(65–69)	D	(50–54)
A	(85–89)	B	(73–76)	C	(60–64)	F	< 50
A-	(80–84)	B-	(70–72)	C-	(55–59)		

Course Policies

Credit cannot be given for late assignments. The assignment weights will be shifted to the rest of the assignments if the missed assignments are due to illness.

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia). Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone

feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mikmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mikmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca). Information: https://www.dal.ca/campus_life/communities/indigenous.html Important Dates in the Academic Year (including add/drop dates) https://www.dal.ca/academics/important_dates.html University Grading Practices https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising

https://www.dal.ca/campus_life/academic-support/advising.html

Science Program

Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre

https://www.dal.ca/campus_life/communities/indigenous.html

Black Advising Centre

https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre

https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library:

<https://libraries.dal.ca/>

Writing Centre:

https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success:

https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office:

<https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines:

<https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre:

https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson:

https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Research Lab Safety:

https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab_policy_manual_2007.pdf

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

ScentFree Program:

<https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>