

Faculty of Science Course Syllabus (revised June 2018)**Department of Mathematics & Statistics**

MATH 3140

Introduction to Wavelets

Fall 2018/2019

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Lectures: MWF 10:35-11:25

Course Description

Wavelet analysis provides an extremely powerful and highly flexible tool for the compression, denoising, and recognition of both audio and image signals. This course will develop many of the essential mathematical ideas behind Fourier analysis and wavelets. Many applications will also be discussed and examined.

Course Prerequisites

MATH 2002.03, and MATH 1030.03 (or MATH 2030.03)

Course Objectives/Learning Outcomes

The objective of this course is for the student to develop a solid understanding of the mathematical formulation of signal and image processing, including Fourier transforms and wavelet analysis. Specific outcomes for the student are:

- Refined skill in creating clear and correct mathematics.
- Familiarity with the techniques of Fourier and wavelet analysis as presented in the course.
- The ability to use concepts from the course to analyse novel problems appropriate to the level of the course.
- A demonstrable overview of how the major theorems presented in the course depend on the web of preliminary results.
- Skills in manipulating the data representing specific signals.

Course Materials

There is no textbook for the course. There will be a large number of class handouts. Students will work with mathematical software such as matlab.

Course Assessment

Assessment is based on regular assignments, a term test and a final exam.

Assignments are due bi-weekly.

Value = 20% of final grade

Term test: November 7.

Value = 20% of final grade

Course project due November 30.

Value = 20% of final grade

Final exam scheduled later.

Value = 40% of final grade

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

Make-up tests or exams will be provided based on a valid medical or compassionate reason.

Course Content

Lecture topics (some of these topics will require more than one lecture):

- Overview of the course and ways of representing a signal.
- Short history of the wavelet revolution.
- Complex numbers and the unit circle.
- Inner products in complex vector spaces.
- Orthonormal bases.
- Working with matlab.
- Project selection.
- The finite Fourier transform.
- Fourier series on a bounded interval.
- The signal space and the Fourier transform.
- Haar wavelets.
- Wavelets in general.
- The Daubechies wavelets.
- Presentation of projects.
- Review.

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 Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq 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

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.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 Students 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

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>

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