EESC03H3 S

Geographic Information Systems and Remote Sensing

Winter 2024 Syllabus

## Course Meetings

### EESC03H3 S

| **Section** | **Day & Time** | **Delivery Mode & Location** |
| --- | --- | --- |
| **LEC01** | Monday, 12:00 PM - 2:00 PM | In Person: IC 230 |
| **PRA0001** | Monday, 2:00 PM - 4:00 PM | In Person: BV 471 |
| **PRA0002** | Monday, 2:00 PM - 4:00 PM | In Person: BV 469 |

Refer to ACORN for the most up-to-date information about the location of the course meetings.

## Course Contacts

**Instructor:** Mike Doughty

**Email:** [mike.doughty@utoronto.ca](mailto:mike.doughty@utoronto.ca)

**Office Hours and Location:** Thursdays 1-3p (EV340)

## Course Overview

This course focuses on the use of Geographic Information Systems (GIS) and Remote Sensing (RS) for solving a range of scientific problems in the environmental sciences and describing their relationship with - and applicability to - other fields of study (e.g. geography, computer science, engineering, geology, ecology and biology). Topics include (but are not limited to): spatial data types, formats and organization; geo-referencing and coordinate systems; remotely sensed image manipulation and analysis; map production.

### Course Learning Outcomes

**Lecture Topics (proposed):**

**L01 Introduction to GIS and Data Models**  
What is a GIS; Contributing disciplines and technologies; Areas of application; Analysis functions; Raster and vector data models

**L02 Maps, Coordinates and Attributes**  
Maps and cartographic abstraction; Projections; Coordinates and attributes; Surveying and GPS; Sampling methodology

**L03 Topology and Vector Operations; Spatial Analysis**  
Topological overlay and vector operations; Spurious polygons; Spatial analysis - operators and methodologies

**L04 Data Sources - Input and Incorporation**  
Primary and secondary data sources; Data errors; Input of spatial data (digitize, scan, convert); Rasterization and vectorization

**L05 Spatial Interpolation; Surface and Volume Representation**  
Characteristics and methodologies of interpolators; Surface representation (2D); Volume representation (3D)

**L06 Spatial Analyis and Modeling**  
Numerical models; Artifical intelligence (ANN; GA; ES); Fuzzy logic; Pattern analysis; Spatial autocorrelation

**L07 Introduction to Remote Sensing**  
Remote sensing - characteristics, systems, applications and components; Aerial photography

**L08 Interaction of EM with the Earths Surface - Overview; Satellites**  
Interaction of EM with vegetation, water and soil; Atmospheric interactions of EM; Earth resource and meteorological satellites

**L09 Tutorial - Remote Sensing, Surveying & GPS**  
Aerial photograph interpretation; Satellite imagery interpretation; Surveying; GPS

**L10 Image Processing and Classification**  
Restoration and correction; Enhancement (CS and filters); Image classification (BR, PCA, Unsupervised/Supervised Classification)

**Prerequisites**: EESA06H3 and 0.5 credit at the B-level in EES courses

**Corequisites**: 0.5 credit at the B-level in EES courses

**Exclusions:** None

**Recommended Preparation**: GGRB30H3

**Credit Value:** 0.5

## Course Materials

There is no required text for this course. Note that almost any GIS text can be used for  
review of concepts discussed in lecture and lab (consult with the Course Instructor as  
necessary).

Required readings will be included/listed within the lecture and lab material.

## Marking Scheme

| **Assessment** | **Percent** | **Details** | **Due Date** |
| --- | --- | --- | --- |
| **Assignment 01** | 15% | Introduction to GIS and Data Models (to be presented January 8th). | 2024-02-05 |
| **Assignment 02** | 15% | Georectification, Digitization, Interpolation and Fuzzy Logic (to be presented February 5th). | 2024-03-04 |
| **Assignment 03** | 15% | Introduction to Remote Sensing (to be presented March 4th). | 2024-04-08 |
| **Midterm** | 15% |  | 2024-02-26 |
| **Final Exam** | 40% | The final exam covers all course material presented during the term (with approximately 40% devoted to pre-midterm and 60% after-midterm). | Final Exam Period |

### Late Assessment Submissions Policy

Late assignments will be penalized at 10% per day.

## Policies & Statements

### Academic Integrity

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.  
  
Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.  
  
On tests and exams, cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University.

### Accommodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible.  
  
AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email [ability.utsc@utoronto.ca](mailto:ability.utsc@utoronto.ca). The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

### Recording of Classroom Material by Students

Recording or photographing any aspect of a university course - lecture, tutorial, seminar, lab, studio, practice session, field trip etc. – without prior approval of all involved and with written approval from the instructor is not permitted.

### Use of Generative Artificial Intelligence Tools

Students may not use artificial intelligence tools for taking tests, writing research papers, creating computer code, or completing major course assignments. However, these tools may be useful when gathering information from across sources and assimilating it for understanding.  
  
The knowing use of generative artificial intelligence tools, including ChatGPT and other AI writing and coding assistants, for the completion of, or to support the completion of, an examination, term test, assignment, or any other form of academic assessment, may be considered an academic offense in this course.