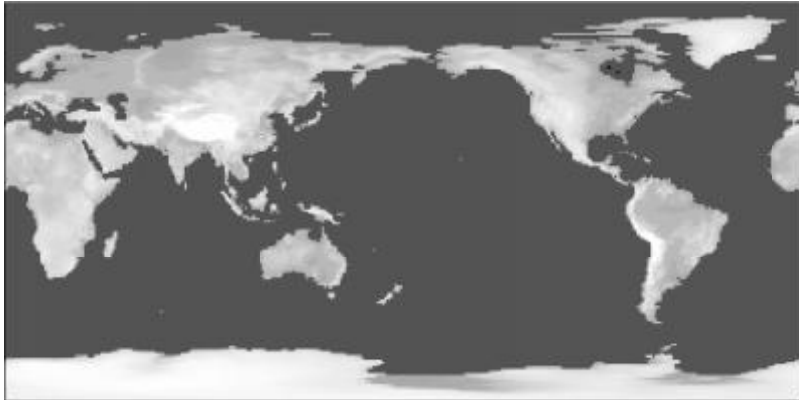


Remote Sensing and Geographic Information Systems (EESC03)

Winter 2023



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Office Hours: TBA
Submission: Quercus only

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.

Lecture Topics

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 Analysis and Modeling

Numerical models; Artificial 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 Earth's 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)

Assignments

A01 Introduction to GIS and Data Models

Introduction to GIS - maps; Surfaces; Projections; Suitability analysis; Vector operations; Geomorphological analysis

A02 Georectification, Digitization, Interpolation and Fuzzy Logic

Georectification and digitization; Interpolation and uncertainty; Structured query language; Fuzzy logic

A03 Introduction to Remote Sensing

Histograms; Saturation; Filters; Composite imagery; Band ratios; Image servers; Supervised and unsupervised classification

Reference Material (optional):

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). The following textbook (with multiple copies) should be available in the library under short-term loan:

Lo, C.P. and Yeung, A.K.W. (2002) *Concepts and Techniques of Geographic Information Systems (2nd Edition)*. Prentice Hall, Upper Saddle River, New Jersey

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

Grading

Assignments (3 Total - Late assignments are penalized 10% per day):

January (A01) - 15% (presented January 9th, due February 6th)

February (A02) - 15% (presented February 6th, due March 6th)

March (A03) - 15% (presented March 6th, due April 6th)

Midterm Test: 15% (February 27)

Final Exam: 40% (TBD)

Lecture Time (HW215)

Monday 12-2pm

Tutorial Time (BV469 and BV471)

Monday 2-4pm

Accommodation and Accessibility

To learn more about accommodations, refer to:

<http://www.vicereprovoststudents.utoronto.ca/Assets/Students+Digital+Assets/Demystifying+Academic+Accommodations.pdf>

For AccessAbility Services at UTSC, see:

<http://www.utsc.utoronto.ca/~ability/>

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact The UTSC Accessibility Services as soon as possible:

Telephone: 416-287-7560

Email: ability.utsc@utoronto.ca

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, including (but not limited to) doctor's notes.