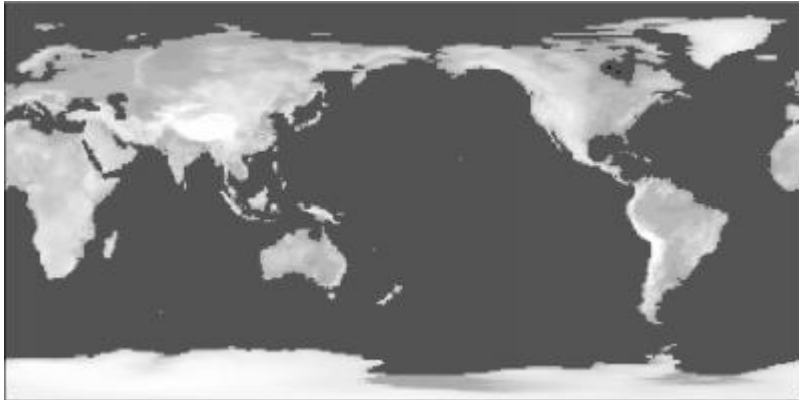


Remote Sensing and Geographic Information Systems (EESC03)

Winter 2019



Mike Doughty

Email: doughty@utsc.utoronto.ca

Office: EV444/TBA

Office Hours: Thursday 12-2p

Slawomir Kowal (TA)

Email: eesc03.2019@gmail.com

Office: BV469/BV471

Office Hours: Monday 4-5p

Submission: eesc03.2019@gmail.com

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 Hands-on Tutorial

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:

Concepts and Techniques of Geographic Information Systems (2nd Edition)

Lo, C.P. and Yeung, A.K.W. (2002) Prentice Hall, Upper Saddle River, New Jersey. (Multiple copies available in library under short-term loan.)

Grading

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

January (A01) - 15% (due February 4)

February (A02) - 10% (due March 4)

March (A03) - 15% (due April 5)

Midterm Test: 15% (February 25)

Final Exam: 45%

Lecture Time (IC220)

Monday 12-2pm

Tutorial Time (BV469/471)

Monday 2-4pm