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 Earths 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:


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