

# Remote Sensing and Geographic Information Systems (EESC03)

Winter 2019



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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; Sp.66675 0 Td (S) Tj 2S*

### L05

### 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