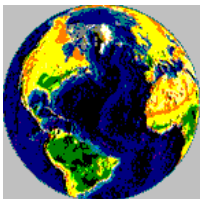

Geography 309

Introduction to Remote Sensing in Geography

Fall 2018

Instructor:	**Joe Piwowar** email: joe.piwowar@uregina.ca phone: 306.585.5273	
Office Hours:	Often	CL 411
Meeting Times:	17:30 - 18:45 TR	CL 418

Introduction

It seems as if the more we study our planet, the more we realize how little we know about it. This is especially relevant in a time of exponential population growth and dramatically changing climates. Remote sensing - the electronic acquisition and digital analysis of Earth imagery - has a key role to play in enhancing our understanding of Earth. It is the only source of data from which we can view the entire planet and monitor changes in the nature of the surface of the Earth through time in a consistent, integrated, synoptic, and numerical manner.

The aim of the course is to introduce you to the ways in which remote sensing systems are used to acquire data, how these data may be analyzed, and how the information is used in studies of the natural and human environments. At the end of the course you will have a good knowledge of the different types of remote sensing imagery that are available and the analysis procedures used for studying specific environmental problems. You will also be capable of undertaking basic computer-assisted image analysis.

Calendar Description

Basic concepts of remote sensing, a review of sensors and their images, emphasis on image interpretation and analysis, and introduction to application areas in geographic studies.

Prerequisite: GEOG 203 or permission of department head. Prior knowledge of ArcGIS is required.

Textbook

Tempfli, K., Huurneman, G. C., Bakker, W. H., Janssen, L. L. F., Feringa, W. F., Gieske, A. S. M., ... Woldai, T. (2009). *Principles of Remote Sensing : An Introductory Textbook*. (ITC Educational Textbook Series; Vol. 2). Enschede: ITC.
https://research.utwente.nl/en/publications/principles-of-remote-sensing-an-introductory-textbook-4

Canada Centre for Remote Sensing (2016). *Tutorial: Fundamentals of Remote Sensing*. Ottawa: Natural Resources Canada.
https://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/satellite-imagery-products/educational-resources/9309

Assignments and Grading

Labs	30% (6 x 5%)
Application of Remote Sensing	5%
Midterm Exam	25%
Final Project*	40%

* You must obtain a passing grade on the Final Project in order to obtain a passing grade in the course.

- All assignments will have a due date clearly printed on the top. Late assignments will lose 10% per day late.
- I encourage you to work together to solve course related problems. All submitted work, however, must be original (i.e. using your own words), unless otherwise specified.
- You require a USB memory stick (5 Gb or larger) for saving image data files.

Labs

There are 6 Lab Assignments that are designed to give you experience in key aspects of remote sensing. You will be using the image analysis components of the *ArcGIS* geographic information system to examine and interpret a variety of remotely sensed imagery. I will be giving you a 1-year license to run *ArcGIS* on your own computer. *ArcGIS* is also accessible on the computers in the library.

Application of Remote Sensing

You are to find a research article about an interesting application of remote sensing and make a brief presentation about it to the class. Application Presentations will be a regular part of each lecture starting in October. A presentation schedule will be posted on UR Courses during the second week of the semester. Details on how to structure your Application Presentation will be distributed next week. No marks will be assigned if you miss your scheduled presentation day or if you fail to hand in a presentation description.

Midterm Exam

An in-class midterm exam will be held on **November 6**.

Remote Sensing Project

The Remote Sensing Project is structured as a practical exercise where you are asked to use the remote sensing knowledge and image interpretation skills you learned in this course to independently solve a geographic problem. The project will be handed out in the middle of November and is due on **December 17**.

Schedule

subject to change

Date	Topics	Readings	
		Principles	Fundamentals
Sep 6	Course Introduction; History & Principles of Remote Sensing	1	
11	*Lab 1: Introduction to Remote Sensing*	1.1 – 1.2	1.1, 1.2
13	Remote Sensing Imagery - The 4 Rs of Image Resolution: Spatial & Spectral	2.1 – 2.2	2.2, 2.3
18	Remote Sensing Imagery - The 4 Rs of Image Resolution: Temporal & Radiometric	2.5	2.1, 2.4, 2.5
20	**Lab 1 Due**; *Lab 2: Spatial, Spectral, and Temporal Resolution*		
25	The Basis of Remote Sensing	2.3 – 2.4	1.4 – 1.8
27	Principles of Visual Image Interpretation Principles of Digital Image Interpretation	7.1 – 7.4	4.1 – 4.3
Oct 2	**Lab 2 Due**; *Lab 3: Image Acquisition*; Image Quality		
4	Image Pre-processing Image Analysis: Vegetation Indices	11.1 – 11.4	4.4 – 4.6
9	Image Classification; Unsupervised Classification	8.1 – 8.3	4.7 – 4.9
11	**Lab 3 Due**; *Lab 4: Unsupervised Classification*		
16	Accuracy Assessment	8.4	4.7 – 4.9
18	Supervised Classification	8.3	4.7 – 4.9
23	**Lab 4 Due**; *Lab 5: Supervised Classification*		
25	Image Classification Summary	8.5	4.7 – 4.9
30	Optical Remote Sensing Systems	4.1 – 4.7	2.8 – 2.16
Nov 1	**Lab 5 Due**; *Lab 6: Selected Applications of Remote Sensing*		
6	**Midterm Exam**		
8	*Fall Break – No Class*		
13	*Final Project assignment*; Strategies for Change Analysis		
15	Strategies for Change Analysis		
20	**Lab 6 Due**; Strategies for Change Analysis		
22	Thermal and Passive Microwave Remote Sensing		2.8 – 2.16
27	Radar Remote Sensing	10.2	3.1 – 3.11
29	Radar Remote Sensing	10.2	3.1 – 3.11
Dec 4	LiDAR Remote Sensing; Hyperspectral Remote Sensing	10.3	
6	Remote Sensing in Perspective		
17	**Final Project Due – December 17 @ 4:00 p.m.**		