

COURSE SYLLABUS



The result of Maximum Likelihood Land Use/Land Cover classification of Landsat ETM+ imagery for Hamilton area.

GEM 403 - ENVIRONMENTAL REMOTE SENSING

COURSE DESCRIPTION

This course introduces students with the principles of Remote Sensing (RS) and develops basic skills in using remote sensing data and techniques for environmental studies. The first part of the course will cover principles and techniques of acquisition, enhancement, and analysis of RS imagery, as well as visual and computer-based image interpretation. The second part of the course deals with application of RS principles and data in environmental studies. Topics include the use of Remote Sensing for environmental applications related to different studies of vegetation, soil, water, air, and land use/land cover.

The goal of the course is to develop an understanding of inventorying, mapping, and monitoring the Earth's natural resources through the measurement, analysis and interpretation of electromagnetic energy emanating from features of interest.

Students will have the opportunity to acquire hand-on experience in digital image processing using the image analysis package integrated into ArcGIS software. A series of laboratory works is designed to lead the students through the key steps in processing of satellite images to detect, extract and evaluate quantitative information about different objects on the Earth's surface.

LEARNING OUTCOMES

The course gives the students an insight into Remote Sensing, both in theory and in practice. Upon successful completion of the course material, the student should be able to:

- Understand fundamental principles of Electromagnetic Radiation;
- Define and appropriately use basic concepts related to Remote Sensing observations;
- Have the ability to discuss the application of RS techniques to real-world environmental issues;
- Investigate functions and characteristics of different satellite and airborne RS systems;
- Evaluate remote sensing data in relation to requirements of a particular task;
- Use different image processing software tools to implement basic operations with RS images;

-Understand and apply basic image analysis techniques in selected environmental applications.

COURSE RESOURCES

Text: Jensen, J. R., 2007 Remote Sensing of the Environment, 2nd ed., Pearson, New York.

Supplemental readings: The e-guides and tutorials from ESRI digital Library and Documentation.

Additional Internet resources and PDF manuals will be recommended for particular modules during the course.

Students will be provided with a variety of study materials (PPT presentations), handouts (PDF) and supplemental materials in digital form. Supplemental materials will be available on the Blackboard and GIS Server.

Online resources: ESRI's Virtual Campus online courses (see course Schedule).

ACCESS TO SOFTWARE

The ESRI ArcGIS 10 and other course software packages run on the Centre for Environment's GIS server. This means that students can access their coursework from any computer using a regular web browser and a high-speed internet connection (i.e. DSL or cable).

PREREQUISITE This course is designed for people who completed GEM400 course. Proficiency with the Microsoft Windows operating system and ArcGIS is required. A high-speed internet connection is required.

EVALUATION

Students complete five assignments designed to provide practical experience with the Remote Sensing and GIS software while simultaneously illustrating and reinforcing theoretical concepts. Each assignment includes exercises accompanied by questions that encourage students to think about the underlying principles that affect the tasks they are performing.

Quizzes will take place during the week six and twelve of the course, and will cover all of the material discussed in the course.

Courses from the ESRI virtual campus will be assigned as additional homework. Proof (PDF copies of the certificates) of completion of these courses will be required.

Overall Assessment

This course requires that you maintain an average of 70% or greater in the course work for continuation in the course. There is an expectation for a high level of quality in the work produced by the student. For evaluation purposes, work will be graded under the following criteria:

Distance Education Certificate Program Grade Scale

Letter Grade Scale	Numerical Scale of Marks
A +	90-100%
A	85-89%
A -	80-84%
B+	77-79%
B	73-76%
B-	70-72%
FZ	0-69%

SEMESTER SCHEDULE: GEM 403 ENVIRONMENTAL REMOTE SENSING

WEEK	TOPIC	LAB/ASSIGN	ASSIGN DUE	TEST	ESRI VC certificates
1	Scope, Physics, and Principles of Remote Sensing	Lab_1 (15%)			
2	Imaging Systems		Lab_1		
3	Optical Remote Sensing	Lab_2 (15%)			
4	<i>Reading week</i>				
5	Thermal, Microwave, and LiDAR Sensing		Lab_2		

6	Digital Image Processing in Remote Sensing	Lab_3 (15%)		Quiz_1 (10%)	
7	Information Retrieval in Remote Sensing		Lab_3		
8	<i>Reading week</i>				
9	Remote Sensing of Land Surface	Lab_4 (15%)			
10	Remote Sensing of Water and Air		Lab_4		
11	Urban Remote Sensing	Lab_5 (15%)			
12	Remote Sensing for Environmental Management		Lab_5	Quiz_2 (10%)	VC Certificates (5%)

NOTE: The topics and schedule can be changed during the term. COURSE ACCESS AND

POLICIES

Blackboard Online Course System: <http://portal.utoronto.ca> > Login > GEM403: GEM 403 – Environmental Remote Sensing

GIS Server: <http://env.environment.utoronto.ca/gis/> > DigitalEarth1 or 1. From Windows: Start > Program Files > Accessories > Communications > Remote Desktop Connections; 2. Tab Options: Computer name - 142.150.189.38, enter your password and username; 3. Tab Local resources: check Disk Drives; 4. Connect

ESRI Virtual Campus: <http://campus.esri.com> > My Training > Start or continue your courses > My Virtual Campus Courses > Login

Instructor: Gennady Gienko, e-mail: ggienko@uaa.alaska.edu

Course Evaluation

Students complete five assignments designed to provide practical experience with the software while simultaneously illustrating and reinforcing theoretical concepts. Each assignment includes exercises accompanied by questions that encourage students to think about the underlying principles that affect the tasks they are performing.

Quizzes will take place during the week five and ten of the course, and will cover all of the material discussed in the course.

Courses from the ESRI virtual campus will be assigned as additional homework. Proof (PDF copies of the certificates) of completion of these courses will be required.

Course Component	Percentage of final grade
Lab/Assignments Submissions	75
Mid and Final Quizzes	20
ESRI Virtual Campus Certificates	5

Late Submission

All assignments are to be submitted by the due date (see Schedule in Blackboard > Course Information). If, due to illness or emergency this will not be possible, please discuss this with the instructor prior to the due date and an individual revised due date may be established.

Assignments received after the due date without negotiation will drop by 10% per day and after 10 days will be graded 0 marks. All assignments set in the course must be submitted in order to receive a Course Grade.

Lost Data

Loss of assignments or other course materials due to your personal computer failure is not an acceptable reason for failing to submit work. Students are expected to make backup copies of their work on a daily basis from your computer to the GIS Server or on other media.

