

GEOG 3231B – Advanced Topics in Remote Sensing Course Outline: Section 001 Winter 2019

1. Course Information

1.1. Classroom Location:

Class Location and Time:

Lecture:	Tuesday	2:30-4:30	UCC 41
Lab:	Wednesday	2:30-4:30	SSC 1059

1.2. Contact Information:

Instructor: Jinfei Wang

Office: SSC 2402

Office Hours: Monday 4:00-5:00, Tuesday 4:30-5:30, or by appointment

Phone: (519)661-2111 x85017

Email: jfwang@uwo.ca

TA: Matthew Roffey, MSc. student

Office: SSC 2434

Office hours: Monday 3:00-4:00, Wednesday 11:30-12:30, or by appointment

Email: mroffey@uwo.ca

2. Calendar Description

2.1. Course Description

Themes to be considered may include: advanced computer analysis of digital satellite and airborne data (optical, infrared and radar), advanced image classification methods, texture analysis, change detection, automatic linear feature extraction, structural pattern recognition and remote sensing applications. Remote sensing software (PCI Geomatica) will be used.

2 lecture hours, 2 laboratory hours, 0.5 course

Antirequisite(s): N/A

Prerequisite(s): Geography 2230a/b.

Adequate mathematical background is needed to be successful

Prerequisite checking is the student's responsibility

2.2. Senate Regulations

Senate Regulations state, "unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites."

3. Textbook

Required Textbook (available in the bookstore):

Jensen, J.R., 2016, "Introductory Digital Image Processing – A Remote Sensing Perspective", 4th Edition, Prentice Hall. (ISBN-10: 0-13-405816-X; ISBN-13: 978-0-13-405816-0).

Recommended Readings

Lillesand, T.M., Kiefer, R.W. and Chipman, J.W., 2015, "Remote Sensing and Image Interpretation", 7th Edition, John Wiley & Sons. (ISBN : 978-1-118-34328-9 (print); 978-1-118-91947-7 (e-book)).

Jensen, J.R., 2007, "Remote Sensing of the Environment: An Earth Resource Perspective", 2nd Edition, Prentice Hall. (ISBN 978-0-13-188950-7).

Richards, A. J., 2013, "Remote Sensing Digital Image Analysis: An Introduction", 5th edition, Springer. (ISBN 978-3-642-30061-5 , ISBN 978-3-642-30062-2 (eBook)).

4. Evaluation

Evaluation Components	Percentage of Course Grade	Assignment Schedule
Lab Assignments (4 labs)	35%	See "Lab assignments" below
Midterm Test	30%	Tuesday, March 12, 2:30pm-4:20pm, UCC 41
Project Presentations	10%	
Term Paper	25%	

Lab assignments and tutorials

Lab #	Topic	Weight
Lab 1	Remotely Sensed Data Collection	5%
Lab 2	Geometric Correction	10%
Lab 3	High resolution supervised classification with textures	10%
Lab 4	High resolution unsupervised classification with textures	10%
Tutorial 1	Atmospheric correction and change detection	
Tutorial 2	RADAR analysis using PolSARPro	

1. Attendance and participation: Each student is required to attend all the lectures and labs. Additional material will be provided during classes, including in class exercises that will be important for the midterm test and for understanding remote sensing.

2. Midterm test: All students are required to take the midterm test. Non-programmable scientific calculators are permitted. No other electronic devices are permitted. No other written aids are allowed. No make-up test will be given unless under extreme circumstances. If you consider that you have grounds to write the midterm test on an alternate date, you must obtain permission from the Dean's office and provide sufficient documentation. In addition, you must inform the instructor at least 2 days in advance before the test.

Students with special accommodation will write make-up tests administered by the department on Fridays during respective periods of the term. To prevent prior disclosure, the format and contents of make-ups may differ substantially from the scheduled test or examination. Please see Additional Statements below.

3. Lab assignments, presentations and the term paper:
You must attend all labs. You should observe all the due dates for the lab assignments and the GIS project. Assignments are due at the beginning of the lab hours of the assignment due dates. Plagiarism or copying is unacceptable. If there are two identical answers to the lab, or parts of the lab., both students will be given a mark of 0 for that lab. The penalty of a late assignment and late term paper is 2^n percent of the maximum mark for the assignment, where n = number of days late. (i.e., If you are late one day, 2% off; two days, 4% off; three days, 8% off; four days, 16% off; five days, 32% off; six days, 64% off; seven days, 100% off).
4. This course requires certain level of mathematics and statistics. It emphasizes on computer algorithms and digital image processing techniques, which will be introduced in lectures and labs, and tested in the midterm test.
5. Required computer storage devices: One or two USB memory key, or a portable hard drive for storing data and results. I suggest that you double backup your work on two USBs, in case one USB has problems. Please note: do not insert your USB with the data from the Windows system to a Mac computer, since this may cause errors on your data.

The following is a suggestion as to what could be used to refer students to the policy on Accommodation for Medical Illness:

For Western's Policy on Accommodation for Medical Illness and a downloadable SMC please refer to the [Academic Handbook](#).

Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments worth 10% or more of their final grade must apply to the Academic Counselling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department.

Grades will not be adjusted on the basis of need. It is important to monitor your performance in the course. Remember: *You* are responsible for your grades in this course.

5. Make-up Examinations

Makeups will be granted with approved documentation only. All documentation for missed exams must be provided the Academic Counselling Office and Instructor within 48 hours of the scheduled exam. For missed exams, you must take your documentation to Academic Counselling within 48 hours of the exam. Otherwise, the instructor will assign a grade of zero. The format and content of make-ups may differ substantially from the scheduled test or examination.

6. Use of Electronic Devices

Scientific calculators are permitted during the midterm test. No other aids are permitted.

7. Academic Offences

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

8. Western's Commitment to Accessibility

The Department of Geography strives at all times to provide accessibility to all faculty, staff, students and visitors in a way that respects the dignity and independence of people with disabilities.

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2147 for any specific question regarding an accommodation. [Information regarding accommodation of exams](#) is available on the Registrar's website.

More information about "[Accessibility at Western](#)" is available.

9. Medical Issues

The University recognizes that a student's ability to meet his/her academic responsibilities may, on occasion, be impaired by medical illness. The Student Services website provides greater detail about the University's policy on [medical accommodation](#). This site provides links the necessary forms. In the event of illness, you should contact Academic Counselling as soon as possible. The Academic Counsellors will determine, in consultation with the student, whether or not accommodation should be requested. They will subsequently contact the instructors in the relevant courses about the accommodation. Once the instructor has made a decision about

whether to grant an accommodation, the student should contact his/her instructors to determine a new due date for tests, assignments, and exams.

Students must see the [Academic Counsellor](#) and submit all required documentation in order to be approved for certain accommodation.

10. Mental Health

If you or someone you know is experiencing distress, there are several resources here at Western to assist you. Please visit Western's [Health and Wellness website](#) for more information on mental health resources.

11. Support Services

[Student Support Services](#)

[Student Development Services](#)

12. Important Dates

January 7: Classes resume

January 15: Last day to add a second term half course

February 18: Family Day – Department Office Closed

February 18 to 22: Spring Reading Week (No classes; Department Office open)

March 7: Last day to drop a second term half course without penalty

April 9: Classes end

April 10: Study day

April 11-30: Examination Period

Topics and Recommended Readings

1. *Introduction*

Readings: Jensen, Introductory Digital Image Processing, Chapters 1 & 2.

- Introduction to remote sensing image processing
- Types of digital remotely sensed data

2. *Geometric Correction*

Readings: Jensen, Introductory Digital Image Processing, Chapter 7.

- Geometric correction

3. *Data Fusion, Vegetation Indices and Texture Analysis*

Readings: Jensen, Introductory Digital Image Processing, Chapter 8.

- Data fusion
- Vegetation indices
- Texture analysis

4. *Pixel-based image Classification*

Readings: Jensen, Introductory Digital Image Processing, Chapters 9 and 13.

- Supervised classification
- Unsupervised classification
- Accuracy assessment
- Using Geomatica for image classification and accuracy assessment

5. *Atmospheric Correction*

Readings: Jensen, Introductory Digital Image Processing, Chapter 6.

6. *Change Detection*

Readings: Jensen, Introductory Digital Image Processing, Chapter 12.

- Band differencing
- Post-Classification

7. *Object-based classification*

Readings: Jensen, Introductory Digital Image Processing, Chapter 9.

8. *Radar and LiDAR Analysis*

Readings: Jensen, Remote sensing of the Environment, Chapters 9 and 10.

- Radar analysis
- LiDAR analysis

9. *Structural Pattern Recognition and Remote Sensing Applications*

- Road network extraction
- Geologic Lineament extraction
- Other types of remote sensing data
- Remote sensing research and case studies (Guest speakers)

Tentative Lecture/lab Schedule

Week #	Date of Monday.	Lecture topics	Labs assigned	Labs due
Week 1	Jan.7	Introduction to the course; Topic 1.	No lab	
Week 2	Jan.14	Topic 2	Lab 1	
Week 3	Jan.21	Topics 2-3	Lab 2	Lab 1 due
Week 4	Jan.28	Topic 4	Lab 2	
Week 5	Feb.4	Topic 4	Lab 3	Lab 2 due
Week 6	Feb.11	Topics 4-5	Lab 3	
Week 7	Feb.18	Reading week, no class	No lab	-
Week 8	Feb.25	Topics 6-7	Lab 4	Lab 3 due
Week 9	Mar.4	Topics 7-8	Lab 4	
Week 10	Mar.11	Midterm test, March 12, 2019 (2:30 pm - 4:20 pm)	Lab 4	
Week 11	Mar.18	Topic 9 / Project help	Tutorial 1/ project help	Lab 4 due
Week 12	Mar.25	Guest speakers / Project help	Tutorial 2/ project help	
Week 13	Apr.1	Class presentations		
Week 14	Apr.8	Class presentations		Term paper due Friday, Apr.12

Last day of classes: April 9, 2019.