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):

Recommended Readings


4. Evaluation

<table>
<thead>
<tr>
<th>Evaluation Components</th>
<th>Percentage of Course Grade</th>
<th>Assignment Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Assignments (4 labs)</td>
<td>35%</td>
<td>See “Lab assignments” below</td>
</tr>
<tr>
<td>Midterm Test</td>
<td>30%</td>
<td>Tuesday, March 12, 2:30pm-4:20pm, UCC 41</td>
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<tr>
<td>Project Presentations</td>
<td>10%</td>
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<tr>
<td>Term Paper</td>
<td>25%</td>
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Lab assignments and tutorials

<table>
<thead>
<tr>
<th>Lab #</th>
<th>Topic</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab 1</td>
<td>Remotely Sensed Data Collection</td>
<td>5%</td>
</tr>
<tr>
<td>Lab 2</td>
<td>Geometric Correction</td>
<td>10%</td>
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<tr>
<td>Lab 3</td>
<td>High resolution supervised classification with textures</td>
<td>10%</td>
</tr>
<tr>
<td>Lab 4</td>
<td>High resolution unsupervised classification with textures</td>
<td>10%</td>
</tr>
<tr>
<td>Tutorial 1</td>
<td>Atmospheric correction and change detection</td>
<td></td>
</tr>
<tr>
<td>Tutorial 2</td>
<td>RADAR analysis using PolSARPro</td>
<td></td>
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</tbody>
</table>

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 2ⁿ 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
   • Introduction to remote sensing image processing
   • Types of digital remotely sensed data

2. Geometric Correction
   • Geometric correction

3. Data Fusion, Vegetation Indices and Texture Analysis
   • Data fusion
   • Vegetation indices
   • Texture analysis

4. Pixel-based image Classification
   • Supervised classification
   • Unsupervised classification
   • Accuracy assessment
   • Using Geomatica for image classification and accuracy assessment

5. Atmospheric Correction

6. Change Detection
   Readings: Jensen, Introductory Digital Image Processing, Chapter 12.
   • Band differencing
   • Post-Classification

7. Object-based classification

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

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

Last day of classes: April 9, 2019.