GEOG 3231A – Advanced Topics in Remote Sensing
Course Outline: Section 001 Fall 2022

1. Course Information

	Delivery Mode	Day/Time	Location
Lecture	In-person	**Tuesday/10:30-12:30**	**SSC 1059**
Lab	In-person	**Thursday/1:30-3:30**	**SSC 1059**

*Details about design and delivery of the course are listed below in Section 5

Classes Start	Fall Reading Week	Classes End	Study day(s)	Exam Period
September 8	October 31-November 6	December 8	December 9	December 10-22

September 16, 2022: Last day to add a first-term half course
October 10, 2022: Thanksgiving Holiday
November 12, 2022: Last day to drop a first term half course without penalty

Course Instructor	Contact Information	Office Hours
Dr. Jinfei Wang	jfwang@uwo.ca	TBA

| Teaching Assistant(s)	Contact Information	Office Hours
Marco Chiu	mchiu52@uwo.ca	TBA
Lab support: Kathy Tang	ktang28@uwo.ca	TBA

☒ Dr. Wang's office hours will be held remotely using Zoom.

☒ TA's Office hours will be held in person.

2. Calendar 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 will be used in lab.
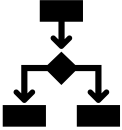
2 lecture hours, 2 laboratory hours, 0.5 course
Antirequisite(s): N/A
Prerequisite(s): Geography 2230 A/B.
Prerequisite checking is the student's responsibility

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

Primary Textbook:
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).

Other 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. Course Objectives and Format

☒ Attendance: Each student is required to attend all lectures, in order to understand the course material and the theoretical parts of the labs.

☒ Students are responsible for material covered in the lectures as well as the assigned chapters/sections in the text.

☒ Required for all computer labs: 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.

☒ Each student will participate in a project presentation about your remote sensing project. Prepare a power point presentation.

All course material will be posted to OWL: http://owl.uwo.ca. Any changes will be indicated on the OWL site and discussed with the class.
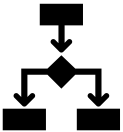
Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click here. [Using the right browser is important, especially when using different features integrated with OWL]

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

5. Course Content and Schedule

Course Content and 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 and LIDAR*
   Readings: Jensen, Introductory Digital Image Processing, Chapter 7.
                    Jensen, Remote sensing of the Environment, Chapters 9.
   - Geometric correction
   - LIDAR

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, 10 and 13.
   - Unsupervised classification and accuracy assessment
   - Supervised classification
   - Machine learning methods

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 Analysis*
   Readings: Jensen, Remote sensing of the Environment, Chapters 9.
   - Radar analysis

9. *Remote Sensing Applications*
   - Remote sensing research and case studies (Guest speakers)

Tentative Schedule:

Week	Dates	Topic	Labs assigned	Due dates
1	Sept 8-9		ArcGIS Pro tutorial	
2	Sept 12-16	Introduction to the course; Topic 1	Lab #0	
3	Sept 19-23	Topic 2-3	Lab #1	
4	Sept 26-30	Topics 3-4	Lab #2	Lab #1 due- Sept 27
5	October 3-7	Topic 4	Lab #2	
6	October 10-14	Topic 4	Lab #3	Lab#2 due – Oct 11
7	October 17-21	Topic 4-5	Lab #3	
8	October 24-28	Topic 6	Lab #4	Lab#3 due- October 25
9	October 31-Nov 4	Reading Week	N/A	N/A
10	November 7-11	Topic 7 / project help	Lab #4	Lab#4 due- Nov. 8
11	November 14-18	Topic #8 / project proposal discussion	Demo #1 / Project help	Proposal due- Nov. 15
12	November 21-25	Topic 9 / guest speakers	Demo #2	
13	Nov 28- Dec 2	Student presentations		
14	December 5-8	No class		Term paper due - December 6

6. Communication

⊠ Students should check the OWL site every 24 – 48 hours

⊠ Updates will be provided on the OWL announcements

7. Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

Assessment	Format	Weighting	Due Date
Lab assignments	Computer labs	55%	See schedule table
Class presentation	Zoom presentation	10%	See schedule table
Project Proposal	Proposal discussion	5%	November 15, 2022
Term paper	Term paper	30%	December 6, 2022

Lab assignments

Lab #	Topic	Weight
Lab 0	Remotely Sensed Data Collection	N/A
Lab 1	DEM generation using LIDAR	10%
Lab 2	Unsupervised classification with textures	15%
Lab 3	Machine learning supervised classification with textures	15%
Lab 4	Change detection	15%
Demo 1	Deep learning introduction	N/A
Demo 2	Radar Analysis	N/A

☒ All assignments are due at 11:55 pm EST unless otherwise specified

☒ Written assignments will be submitted to Turnitin

☒ Rubrics will be used to evaluate assessments

☒ After an assessment is returned, students should wait 24 hours to digest feedback before contacting their evaluator; to ensure a timely response, reach out within 7 days.

The table below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

Information about late or missed evaluations:

☒ Lab assignments: You must attend all labs. You should observe all the due dates/times for assignments. Plagiarism or copying is unacceptable. If there are two identical answers to a lab. or parts of the lab., both students will be given a mark of 0 for that lab. All

assignments are due by 11:55PM on the due date. Late assignments will be accepted for up to four days after the due date. After that the late work is no longer accepted regardless if the OWL assignment submission is open or not. The late penalty in percentage of the total mark of the assignment is 5% for one day late, 25% for two days late, 45% for three days late, 65% for four days late. Lateness is based on the time the assignment is received through OWL, not on the time it was created on student's own computer.

☒ Late assessments <u>without</u> illness self-reports will be subject to a late penalty (see above).

☒ Late assessments <u>with</u> illness self-reports should be submitted within 24 hours of submission of the last illness self-report

Grades <u>will not be adjusted</u> 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.

8. Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: [Academic Accommodation for Students with Disabilities](#).

Academic Consideration for Student Absence

The University recognizes that a student's ability to meet their academic responsibilities may, on occasion, be impaired by medical illness. Illness may be acute (short term), or it may be chronic (long term), or chronic with acute episodes. The University further recognizes that medical situations are deeply personal and respects the need for privacy and confidentiality in these matters. However, in order to ensure fairness and consistency for all students, academic accommodation for work representing 10% or more of the student's overall grade in the course shall be granted only in those cases where there is documentation indicating that the student was seriously affected by illness and could not reasonably be expected to meet their academic responsibilities.

Policy on Academic Consideration for Medical Illness - Undergraduate Students

Student Medical Certificate (SMC)

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the [Western Multicultural Calendar](#).

9. Make-up Examinations

N/A

10.   How to Be Successful in this Class:

Students enrolled in this class should understand the level of autonomy and self-discipline required to be successful.

1. Invest in a planner or application to keep track of your courses. Populate all your deadlines at the start of the term and schedule time at the start of each week to get organized and manage your time.
2. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.
3. Follow weekly checklists created on OWL or create your own to help you stay on track.
4. Take notes as you go through the lesson material. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively.
5. Connect with others. Try forming a study group and try meeting on a weekly basis for study and peer support.
6. Do not be afraid to ask questions. If you are struggling with a topic, check the online discussion boards or contact your instructor(s) and or teaching assistant(s).
7. Reward yourself for successes. It seems easier to motivate ourselves knowing that there is something waiting for us at the end of the task.

11. Continuity of Education Plan (in-person class pivoting to online learning)

In the event of a COVID-19 resurgence during the course that necessitates the university to direct courses move away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

12. <u>Information on COVID-19</u>

Masking Guidelines

Students will be expected to wear triple layer, non-medical, paper masks at all times in the classroom as per University policy and public health directives. Students who are unable to wear a mask must seek formal accommodation through Western Accessible Education, and present medical documentation.

Students are not permitted to eat or drink while in class (both lectures and labs) to ensure masks stay in place. Students will be able to eat and drink outside of the classroom during scheduled breaks.

Students unwilling to wear a mask as stipulated by Western policy and public health directives will be referred to the Dean, and such actions will be considered a violation of the student Code of Conduct.

Course Absences due to Daily COVID Screening Questionnaire

Missed assessments (e.g., presentations, essays, quizzes, tests, midterms, etc.) require formal <u>academic considerations</u> (typically academic counselling).

Students who demonstrate a pattern of routinely missing coursework due to self-reported COVID symptoms, and therefore do not demonstrate mastery of the learning outcomes of the course, will not receive credit for the course.

13. Academic Offences

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

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).

14. Western's Commitment to Accessibility

The Department of Geography and Environment 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. <u>Information regarding accommodation of exams</u> is available on the Registrar's website.

More information about <u>"Accessibility at Western"</u> is available.

15. 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 <u>Health and Wellness website</u> for more information on mental health resources.

16. Support Services

<u>Western's Support Services</u>
<u>Student Development Centre</u>

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

17. Important Dates

September 8: Classes resume
September 16: Last day to add a first term half course
October 10: Thanksgiving Holiday – Department Office Closed

October 31 to November 6: Fall Reading Week (No classes; Department Office open)
November 12: Last day to drop a first term half course without penalty
November 30: Last day to drop a full course without penalty
December 8: Classes end
December 9: Study day
December 10-22: Examination Period