GEOG 3231A – Advanced Topics in Remote Sensing
Course Outline: Section 001 Fall 2024

1. Course Information

Classes Start	Fall Reading Week	Classes End	Study day(s)	Exam Period
September 5	October14-30	December 6	December 7 & 8	December 9-22

September 13, 2024: Last day to add a second-term half course
September 30, 2024: National Day for Truth and Reconciliation (observed as a non-instructional day at Western).
October 14, 2024: Thanksgiving Holiday
November 30, 2024: Last day to drop a first term half course without penalty

Course Instructor	Contact Information	Office Hours
Dr. Jinfei Wang	jfwang@uwo.ca	TBD Zoom link in OWL; or by appointment

| Teaching Assistant(s)	Contact Information	Office Hours
Mohammad Rokhafrouz	mrokhafr@uwo.ca	TBD or by appointment
Lab support: Kathy Tang	ktang28@uwo.ca	By appointment

☒ 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.
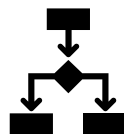
2 lecture hours, 2 laboratory hours, 0.5 course
Antirequisite(s): N/A
Prerequisite(s): Geography 2230 A/B.
Prerequisite checking is the student's responsibility

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 Reference Book:
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; 9780134395166 (e-book)).

To order e-book:
GEO3231A https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2022A&courses%5B0%5D=001_UW/GEO3231A

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 reference book.
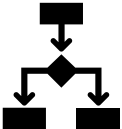
☒ Required for all computer labs: One or two USB memory key, or a portable hard drive for storing data and results. I suggest that you double backup your work on two USBs, in case one USB has problems.

☒ 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 the new OWL Brightspace learning environment: https://westernu.brightspace.com/d2l/home. Any changes will be indicated on the OWL site and discussed with the class.

Current versions of all popular browsers (e.g., Safari, Chrome, Edge, Firefox) are supported with OWL Brightspace; what is most important is that you update your browser frequently to ensure it is current. All JavaScript and cookies should be enabled."

If students need assistance, they can seek support on the OWL Brightspace 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.

Tentative Schedule:

Week	Dates	Topic	Labs assigned	Lab due (Friday)
1	Sept 5-6	--	--	
2	Sept 9-13	Introduction to the course; Topic 1	ArcGIS Pro tutorial / Lab #0	
3	Sept 16-20	Topic 2-3	Lab #1	
4	Sept 23-27	Topics 3-4	Lab #2	Lab #1
5	Sept 30-October 4	Topic 4	Lab #2	
6	October 7-11	Topic 4	Lab #3	Lab #2
	October 14-18	Fall Reading Week	N/A	
7	October 21-25	Topic 4-5	Lab #3	Lab #3
8	October 28-Nov 1	Topic 6	Lab #4	
9	November 4-8	Topic 7 / project help	Lab #4	Lab#4
10	November 11-15	Topic #8 / project proposal discussion	Demo #1 / Project help	Proposal due- Nov. 15
11	November 18-22	Topic 9 / guest speakers	Demo #2 / Invited speaker	
12	November 25-29	Student presentations		
13	Dec 2-6	Student presentations		Term paper due - December 6, 2024

6. Communication

⊠ Students should check the OWL site every week and before each lecture and lab

⊠ 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
Project Proposal	Proposal	5%	November 15, 2024
Class presentation	Class presentation	10%	See schedule table
Term paper	Term paper	30%	December 6, 2024

Lab assignments

Lab #	Topic	Weight
Tutorial 1	Intro to ArcGIS Pro	N/A
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	TBD	N/A

☒ All assignments are due at 11:55 pm EST (see schedule table) 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.

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](#).

General Information about missed work:

University policy on academic considerations are described <u>here</u>. This policy requires that all requests for academic considerations must be accompanied by a self-attestation. Further information about academic considerations, and information about submitting this self-attestation with your academic consideration request may be found here.

Please note that any academic considerations granted in this course will be determined by the instructor, in consultation with the academic advisors in your Faculty of Registration, in accordance with information presented in this course outline.

Formal Documentation Designation statement:

Please note that the final term paper is considered to be central to the learning objectives for this course. Accordingly, students seeking academic consideration for this assessment will be required to provide formal supporting documentation. Students who are granted academic consideration for this assessment will be provided with the following opportunity to make up this work: One week extension.

Flexibility statements

Every student will be allowed to submit a Lab Assignment late one time in this course this term. You will have 72 hours grace period. For example, for Friday night deadline, you can have till the next Monday night to submit. The TA will identify this the first time you submit late. Any additional extensions or longer extensions will require formal academic consideration, otherwise late penalty (above) will apply.

Absence from Course Commitments

Students must familiarize themselves with the <u>Policy on Academic Consideration –
Undergraduate Students in First Entry Programs</u>

Students missing course work for medical, compassionate or extenuating circumstances can
request academic consideration by completing a request at the central academic consideration
portal. Students are permitted one academic consideration request per course per term
without supporting documentation. Note that supporting documentation is **always** required
for academic consideration requests for examinations scheduled by the office of the registrar
(e.g. December and April exams) and for practical laboratory and performance tests typically
schedule during the last week of the term. Students should also note that the instructor may
designate one assessment per course per term that requires supporting documentation. This
designated assessment is described elsewhere in this document. Please note that any
academic considerations granted in this course will be determined by the instructor of this
course, in consultation with the academic advisors in your Faculty of Registration, in
accordance with information presented in this course outline. Supporting documentation for
academic considerations for absences due to illness should use the <u>Student Medical Certificate</u>
or, where that is not possible, equivalent documentation by a health care practitioner.

Accommodation for Religious Holidays

Students should review the policy for <u>Accommodation for Religious Holidays</u>. Where a student
will be unable to write examinations and term tests due to a conflicting religious holiday, they
should inform their instructors as soon as possible but not later than two weeks prior to
writing the examination/term test. In the case of conflict with a midterm test, students should
inform their instructor as soon as possible but not later than one week prior to the midterm.

9. Make-up Examinations

N/A

10. 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).

11. 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. Information regarding accommodation of exams is available on the Registrar's website.

More information about "Accessibility at Western" is available.

12. 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.

13. 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.

14. Support Services

Western's Support Services
Student Development Centre

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.

15.   Important Dates

September 5: Classes resume
September 13: Last day to add a first term half course
October 14: Thanksgiving Holiday – Department Office Closed
October 14-20: Fall Reading Week (No classes; Department Office open)
November 30: Last day to drop a first term half course or a full course without penalty
December 6: Classes end
December 7 and 8: Study days
December 9-22: Examination Period