Faculty	**Faculty of Environmental and Urban Change**
Course	**GEOG 3440: Remote Sensing for Earth Observation**
Credits	3.00
Term	Fall 2023

Course Director

Instructor	Dr. Tarmo K. Remmel
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eClass	eclass.yorku.ca
Office Hour	Tuesday 1300-1400h

Zoom

Currently, this **course is scheduled to be in-person**. Should the situation change, and this course be forced to pivot to a virtual format, lectures will be provided as pre-recorded videos (accessible via eClass) with additional weekly discussions and office hours with the TA and me via Zoom. Details on how to connect will be distributed only if this scenario were to happen.

eClass

This course will be actively managed through eClass. As a student enrolled in this course, you will be guided through this course on a weekly basis. Assessments, readings, lecture and lab materials, calendars, discussion forms, completion tracking, and all necessary interactivity will be coordinated through this platform. You are encouraged to log in regularly and to keep up with requirements. All course materials will be made available in advance.

Course: https://eclass.yorku.ca/course/view.php?id=93814
Mobile App: https://lthelp.yorku.ca/mobile-app

Calendar Description

Introduction to the methods in which remote sensing data are collected, processed, and analyzed. An emphasis is placed on environmental applications. The synergy between the technologies of remote sensing and geographic information systems (GIS) is also stressed.

Prerequisites: AP/GEOG 2420 3.00 or SC/GEOG 2420 3.00 or ES/ENVS 2010 6.00 and one 2000-level environmental studies theme foundation course; or written permission of the instructor. **Course credit exclusions:** ES/ENVS 3521 3.00 (prior to Fall 2013). **Previously offered as:** AP/GEOG 3440 3.00, SC/GEOG 3440 3.00.

Expanded Description

This course represents an introduction to the methods in which remote sensing data are collected, processed, and analyzed. An emphasis is placed on environmental applications. The synergy between the technologies of remote sensing and geographic information systems (GIS) is also stressed. Two lecture hours, two laboratory hours. One term.

Textbook

Chuvieco, E. 2020. Fundamentals of satellite remote sensing: an environmental approach (3rd ed.) Boca Raton: CRC Press. 415 p.

Readings

All required readings for this course are drawn from the course textbook (and may be supplemented by peer-reviewed literature published in academic journals). Weekly readings are indicated on eClass.

Missed Assessments

You are encouraged to fully partake in all course activities. There are no make-up assessments; with appropriate documentation and approval, weights of missed assessments *might* be added to the final exam. With course instructor approval assessment *might* be granted extensions.

Notice

In the best interest of the course, the instructor reserves the right to modify delivery and scheduling of course content.

Meetings

Lectures (Remmel)

Lectures are held in-person on Mondays 0930-1130h in LSB 107. **You are expected to complete the readings prior to the weekly lecture. Come prepared to discuss, ask, and contribute – your engagement is critical for success in this class.**

Lab 01 (Waters)

Labs are held in-person on Mondays 1230-1430h in HNE 253 (an undergraduate teaching computer lab). **You are expected to complete weekly readings and any additional requirements prior to the weekly lab session. Come prepared to discuss, ask, and contribute – your engagement is critical for success in this class.**

Teaching Assistant: Brian Waters (brianmah@yorku.ca)
Office Hours: TBD

Learning Objectives

Students will…

1. **describe** key components and methods required by remote sensing by **using** core terminology.
2. **research** and **summarize** key remote sensing literature to **discuss** broad application areas.
3. **perform** core computations and image processing tasks on remote sensing images.
4. **compare** remote sensing results among competing methods by quantitative and visual means.
5. **construct** and **defend** a workflow for remote sensing image processing.

Evaluation

Description	Weight (%)	Due	Submission Format
Assignment 1	5	24 September	eClass
Assignment 2	10	15 October	eClass
Assignment 3	15	05 November	eClass
Assignment 4	15	19 November	eClass
Assignment 5	15	06 December	eClass
Engagement/Discussion	15	Weekly	eClass/Lectures/Labs
Final Exam	25	Exam Period	eClass (take-home)

Penalties

- Late submission of course work will be penalized 15% of the total assignment value per calendar day. The first 15% penalty is applied once the deadline has passed; subsequent penalties are then applied every 24 hours thereafter that the work is not submitted.
- Penalties accumulate until the work is submitted or a grade of zero is reached.
- Upon reasonable grounds and with individual consultation with the course instructor, extensions *might* be granted for course work.

Schedule

				Monday			Monday		Chuvieco (3rd ed.)
Month	Date	Week	Lecture	Lecture: 0930-1130h			Lab: 1230-1430h	Assignments	Readings
September	11	1	1	Introduction	EMR Basics		PCI license, using AppsAnywhere, Basic navigation, Naming, …	A1	Chapters 1, 2
	18	2	2	Images, Spectral Signatures, XS, Greyscale, Pseudo			File management, copies, utility, clipping, opening, viewing, PCT editor		Chapter 2, 6 (Specifically 6.1, 6.4)
	25	3	3	Orbits	Sensors	Satellites	Radiometric calculations	A2	Chapters 3, 4, 5
October	2	4	4	Geometric Correction			Geometric Rectification		Chapter 6 (Specifically 6.6)
	9	5	Thanksgiving and Reading Week						
	16	6	5	Colour Theory	Radiometric Enhancement		Radiometric Enhancements (Raw vs. Enhanced), Filtering, Histograms	A3	Chapter 6 (Specifically (6.5)
	23	7	6	Supervised Classification			Supervised Classification		Chapter 7 (Specifically 7.2)
	30	8	7	Unsupervised Classification			Unsupervised Classification and masks		Chapter 7 (Specifically 7.1.3); Supplementary
November	6	9	8	Vegetation Indices (NDVI, dNBR)			Raster Calculator, Band Combinations	A4	Chapter 8; Supplementary
	13	10	9	Change Detection (Pre/Post/Hybrid)			MAT		Chapter 8; Supplementary
	20	11	10	Snow and Ice	Soil	Water	Making Cartographic Products	A5	Chapter 7 (Specifically 7.3.4)
	27	12	11	Mosaiking			Mosaic		Supplementary
December	4	13	12	Accuracy Assessment		Concluding Remarks	Accuracy Assessment		Congalton (1991)

Academic Honesty and Integrity

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty. The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards. http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senatepolicy-on/

There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve students' research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website at: http://www.yorku.ca/academicintegrity/

Ethics Review Process

York students are subject to the York University Policy for the Ethics Review Process for Research Involving Human Participants. Students proposing to undertake research involving human participants (e.g., interviewing the director of a company or government agency, having students complete a questionnaire) are required to submit an Application for Ethical Approval of Research Involving Human Participants at least one month before you plan to begin the research. If you are in doubt as to whether this requirement applies to you, contact your Course Director immediately.

Religious Observance

York University is committed to respecting the religious beliefs and practices of all members of the community and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete an Examination Accommodation Form, which can be obtained from Student Client Services, Student Services Centre or online at:

http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf

Access & Disability	York University is committed to principles of respect, inclusion, and equality of all persons with disabilities across campus. The University provides services for students with disabilities (including physical, medical, learning, and psychiatric disabilities) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University. Students in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with disabilities services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs. Additional information is available at the following websites: Counselling & Disability Services: https://counselling.students.yorku.ca/ Counselling & Disability Services at Glendon: https://www.glendon.yorku.ca/counselling/ York Accessibility Hub: http://accessibilityhub.info.yorku.ca/
Student Conduct in Academic Situations	Student Conduct in Academic Situations Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at: http://secretariat-policies.info.yorku.ca/policies/disruptiveandor-harassing-behaviour-in-academic-situations-senate-policy/
Important Dates and Links	Please refer to https://registrar.yorku.ca/enrol/dates/2023-2024/fall-winter for important dates pertaining to the academic term. Last date to drop a course without receiving a grade is 8 November (see also Financial Deadlines). For details on grading schemes, assignment submissions, lateness Penalties, missed tests, group work, inclusivity in EUC, religious observance days, academic honesty, intellectual property notices, student conduct, student support and student accessibility services, see https://euc.yorku.ca/academic-policies-procedures-petitions/ and go to “Undergraduate Courses Common Instructions”.