

GGR1916H Remote Sensing of Vegetation Traits and Function

Instructor

Prof. Jane Liu

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Office hours: 1:00-3:00 pm, Monday, or by appointment.

Teaching Assistant

TBA

E-Mail: TBA

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Office hours: TBA

Lectures

Thursday, 10 am -12 noon, SS1088

Tutorials

Tutorials are offered on Fridays, 2-4 pm, on 19 September and 31 October 2019.

Prerequisite

10.0 FCE's including GGR337H1

Recommended Preparation: GGR272H1, GGR273H1, GGR373H1

The requirement is flexible and can be discussed with the instructor.

Outline

This course is offered in conjunction with GGR414H Advanced Remote Sensing. Building on GGR337H1 Environmental Remote Sensing (also offered as a graduate course GGR1911H), which covers the basic theories and techniques of optical and microwave remote sensing of the land surface, GGR1916H introduces advanced theories and techniques for land cover mapping, retrieval of vegetation structural and physiological traits, and remote sensing of vegetation light use efficiency and photosynthetic capacity. Diagnostic ecosystem models will also be introduced for terrestrial water and carbon cycle estimation using remote sensing data. Optical instruments for measuring vegetation structural parameters in the field will be demonstrated, and high-resolution remote sensing images acquired from a drone system will be used as part of the teaching material and lab assignments. For GGR1916H additional lectures will be offered on basic radiative transfer theories as applied to remote sensing of vegetation traits and function.

Text Book

No textbook is suitable. Papers relevant to each class will be provided

References

Liang, S. 2003, Quantitative Remote Sensing of the Land Surface. Wiley-Interscience, ISBN-

Evaluation

Assignment 1	20%	Due: 3 Oct. 2019
Midterm	20%	24 Oct. 2019
Assignment 2	20%	14 Nov. 2019
Final exam	40%	Examination period

All assignments should be submitted on the due day by 4:00pm. Late lab assignments will be penalized at 10% of the portion of the lab for each day of delay, i.e., a multiplying factor of 0.9 will be used for 1-day delay, and 0.8 for 2-day delay, etc.

Note: If you feel that you are having difficulty keeping up with assignments or understanding the material we are covering, please see me as soon as possible.

Learning objectives

Built on prior training, graduate students in this course will continue to learn advanced image processing and information retrieval techniques and will have the opportunity to practice the use of high resolution drone-measured images to retrieve vegetation structural parameters measured on the ground. Students will also be able to master basic radiative transfer theories as applied to vegetation remote sensing and the use of remote sensing data in ecosystem modeling.

Schedule

Week	Date	Lecture subject	Tutorial/Assignment
1	Sep 5	Introduction Review of radiation terms	
2	Sep 12	Global land cover mapping	
3	Sep 19	Radiative transfer theory Plant canopy radiation models Assignment 1 Tutorial	#1, 20%, due on Oct. 3.
4	Sep 26	Multispectral remote sensing of LAI	
5	Oct 3	Multi-angle remote sensing of clumping index	
6	Oct 10	Lidar techniques Lidar applications	
7	Oct 24	Mid-term exam Radar applications	Mid-term exam 20%.
8	Oct 31	Remote sensing of leaf pigments	#2, 20%, due on Nov. 14.
9	Nov 7	Reading week	
10	Nov 14	Remote sensing of plant function PRI and LUE	

11	Nov 21	Sun-induced chlorophyll fluorescence (SIF) and GPP	
12	Nov 28	Simple remote sensing-based GPP and ET models	
13	Dec 4	Process-based modeling of GPP using remote sensing inputs Review.	

GGR1916 students are expected attend all lectures of GGR414 listed in above schedule. Three additional 1-hour lectures will be given on: (1) radiance-irradiance conversion, (2) canopy radiation modeling (part 2), and (3) Sun-induced chlorophyll fluorescence angular correction. The time of these lectures will be decided shortly after lecture 1.

Academic Integrity

It is your responsibility as a student at the University of Toronto to familiarize yourself with, and adhere to, both the Code of Student Conduct and the Code of Behaviour on Academic Matters.

This means, first and foremost, that you should read them carefully.

- The Code of Student Conduct is available from the U of T website: <http://www.governingcouncil.utoronto.ca/policies/studentc.htm>
- The Code of Behaviour on Academic Matters is available from the U of T website: <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>

See also the University's website on Academic integrity: www.utoronto.ca/academicintegrity.

Accessibility Services

The University of Toronto is committed to accessibility. If you require accommodations or have any accessibility concerns, please visit Accessibility Services at <http://www.accessibility.utoronto.ca/> as soon as possible.

For more information please contact Accessibility Services at Robarts Library

1st Floor (ground entrance off St. George St.)

130 St. George Street, Toronto, ON M5S 3H1

Voice: 416-978-8060

Fax: 416-978-8246

TTY: 416-978-1902

Email: accessibility.services@utoronto.ca

Web: www.accessibility.utoronto.ca

Policies

Assignments: Assignments should be submitted on the due day by 4 pm. All assignments should be turned into the drop box located outside of the Geography main office (Sidney Smith Hall, Room 5047). Electronic submissions will not be accepted. Late assignments will be subject to a late penalty of 10% per day (including weekends) of the total marks for the assignment.

Assignments submitted five calendar days beyond the due date will be assigned a grade of zero.

You can only turn in a late assignment during business hours, normally between 9am and 5pm, Monday – Friday. They will be time stamped at 5 pm on the day submitted.

Missed Quiz/Test: There will be no re-writes or make-ups for term tests/quizzes missed for University-accepted, verifiable reasons. Instead the final exam will be re-weighted by the value of the missed term test/quiz.

Informing Your Instructor and Submitting Appropriate Documentation: Students must submit a University-accepted documentation (e.g., signed U of T medical certificate) within **one week** of a missed assignment due date or test date. Failure to submit appropriate documentation will result in a grade of zero. Please submit original documentation.

Geography Math Help Centre

A resource for this course is the department's Math Help Centre. Geography TAs will be available to help refresh and explain math concepts and techniques that may come up in your Geography courses. This includes working with formulas, graphing data, completing calculations, and so forth. It does not matter how basic your questions are! No appointment is required, just drop by. There will also be table space available in the room, allowing students to get math help as they work through assignments. Details on location and TA times will be posted here:
<http://geography.utoronto.ca/undergraduate/math-help/>

Appendix

Graduate Course Policies

Important Dates

Graduate courses are normally a minimum of 2-3 hours/week for 12 weeks. Reading week is optional for graduate courses. If observed, the instructor will inform the class and provide a make up date for the missed class.

Fall 2019	
July 15	Course enrolment begins
September 9	Most formal graduate courses and seminars begin
September 11	Summer session grades available for viewing online in ACORN
September 23	Final date to add full-year and Fall session courses
October 14	Thanksgiving Day (University closed)
October & November	Undergraduate Reading Week: UTM – Oct. 15-18; UTSC – Oct. 12-18; STG – Nov 4-8*
October 28	Final date to drop fall session half or full courses without academic penalty
November 25-29	Last week of graduate classes*
December 23	University closed for winter break until January 3 inclusive
Winter 2020	
January 6	University reopens, most formal graduate courses and seminars begin
January 8	Submission deadline for Fall session grades

January 15	Fall session grades available for viewing online in ACORN
January 20	Final date to add Winter session courses
February 17	Family Day (University closed)
February	Undergraduate Reading Week: UTM – Feb. 18-21; UTSC – Feb 15-21; STG – Feb 17-21*
February 24	Final date to drop full-year and winter courses without academic penalty
March 23-27	Last week of graduate classes*
April 10	Good Friday (University closed)
April 15	Winter grades due for students graduating in June 2020
Summer 2020	
May 6	Submission deadline for Winter session grades (for students not graduating in June)
May 13	Full-year and Winter session grades available for viewing online in ACORN

*If undergraduate reading week is observed, the instructor must provide a make-up date for the missed class. This may include an extra class at the end of term.

Course Syllabi

A final course syllabus, which includes all assignments, deadlines and weighting of methods of evaluation, must be made available to all students enrolled in the course as early as possible, no later than the deadline for enrolling in classes (September 23, 2019 for fall courses and January 20, 2020 for winter courses).

Changes to the methods of evaluation or their relative weights cannot be made after this date without the consent of a simple majority of students in the class, provided a vote is announced at the previous class meeting.

Late Assignments

Instructors are not obligated to accept late work, except where there are legitimate, documented reasons beyond a student's control. In such cases a late penalty is not normally applied. In all other circumstances, if an instructor intends to accept and apply penalties to late assignments this will be clearly set out in the syllabus.

Attendance and Participation

Although attendance makes up no more than 20% of the final course grade, regular and consistent attendance in graduate courses is expected. Most graduate courses are seminar style classes, which involve collaborative work and in-class discussions with other students and instructors. Students who are unable to attend class each week must inform the instructor as early as possible.

Accessibility and Accommodations

The University of Toronto is committed to accessibility. If you require accommodations because you are disabled, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible:

<http://studentlife.utoronto.ca/as>

Where there is an accommodation recommended by Accessibility Services, the department and/or instructors will be provided with an accommodation letter.

Academic Integrity

Academic misconduct by graduate students is taken very seriously. The University's policy on academic misconduct is found in the Code of Behaviour on Academic Matters (the Code).

Students in graduate studies are expected to commit to the highest standards of integrity and to understand the importance of protecting and acknowledging intellectual property. For example, it is assumed that they bring to their graduate studies a clear understanding of how to cite references appropriately, thereby avoiding plagiarism.

Regarding plagiarism, the Code includes the following statements:

B.i.1. It shall be an offence for a student knowingly:

(d) to represent as one's own idea or expression of an idea or work of another in any academic examination or term test or in connection with any other form of academic work, i.e., to commit plagiarism.

Wherever in the Code an offence is described as depending on "knowing," the offence shall likewise be deemed to have been committed if the person ought reasonably to have known.

Other academic offences include the possession and/or use of unauthorized aids in examinations, submitting the same paper for different courses, forgery (whether of academic records or other documents), concocting facts or references to sources, personating someone, and other forms of cheating and academic dishonesty. Please refer to sections B.i.1. and B.i.3. in the Code for detailed descriptions of offences applicable to students.

The policy on academic misconduct and the process for handling an allegation of academic misconduct is outlined at <http://www.sgs.utoronto.ca/facultyandstaff/Pages/Academic-Integrity.aspx>

Coursework Extensions

The authority to grant an extension to submit coursework beyond the sessional grade deadline is with the department and not the instructor of the course. To request a formal extension, students must submit a Coursework Extension Form, completed by both the student and course instructor, to the relevant graduate department prior to the final grade deadline.

In order to ensure fairness in granting extensions, the department must be reasonably certain that:

- The reasons for delay are serious and substantiated.
- The student is not granted unfair advantage over other students in the course.
- The student has a reasonable chance of completing the outstanding work within the time allotted.
- The normal and satisfactory completion of any new coursework is not in jeopardy.

Extension requests for medical reasons (e.g. short-term illness) must be accompanied by a medical note. Extension requests for students with accommodations due to disability must be supported by documentation from Accessibility Services. Extension requests for other reasons must be detailed in the form or a note to the department.

Religious Accommodations

Students must alert instructors in a timely fashion to any upcoming religious observances and anticipated absences. Instructors will make every reasonable effort to avoid scheduling tests, exams or other compulsory activities at these times. In the case of an unavoidable conflict with a compulsory activity, every reasonable effort is made to give students the opportunity to make up missed work.

Course Enrolment and Quercus

Acorn is the only indicator of official course enrolment; Quercus is not. Students enrolled in Acorn will be automatically populated to a course's Quercus site within 24 hours of enrolling. In some cases, if a student is on a course wait list or there is another delay in processing registration an instructor may give a student access to Quercus as a guest. This will not constitute official enrolment and students are responsible for making sure the course is added correctly using Acorn.

Auditing

Students who wish to audit a course must obtain permission directly from the course instructor within the first week of class. Permission is subject to available space and can only be granted by the course instructor.

Only registered students at the University of Toronto may audit courses. Auditing entitles a student to attend lectures only. Students may not submit any written work, attend labs/tutorials or write tests/exams. The student will not be enrolled in the course and the course will not appear on their transcript. The department does not provide certificates of attendance.

Reading Courses

Reading courses allow students to complete coursework in topics not covered by current course offerings in Geography or Planning. Reading course guidelines and form is found at <https://geography.utoronto.ca/wp-content/uploads/2012/07/ReadingCourseInstructions.pdf>. The form must be accompanied by a brief course outline.

Copyright in Instructional Settings

If a student wishes to record (tape, video, photograph, etc.) any lecture presentations or other similar materials provided by the instructor; the instructor's written consent must be obtained beforehand. Otherwise, all such reproduction is infringement of copyright and prohibited. In the case of private use by students with disabilities, the instructor's consent shall not be unreasonably withheld.