GEOG 3200 - INTRODUCTION TO REMOTE SENSING

COURSE OUTLINE: FALL 2015

DESCRIPTION

Remote sensing is defined as any technique used to obtain an observation or measurement from a distance. Numerous techniques fit this definition, ranging from aerial photographs to satellite based systems. This course will provide an introduction to these remote sensing devices, as well as the general theory and principles of electromagnetic interaction. Applications including geological, geomorphological, climatological and environmental monitoring will also be covered. Upon completion, students will be able to advise on the various types of remote sensing data that are available and on various processing procedures for extracting information from remote sensing data (through developed computer laboratory assignments).

My goal for this course is to make sure every student receives an excellent final grade and each student live up to their full potential.

COURSE OBJECTIVES

- Describe the remote sensing process, including the various steps from energy source to product
- Examine the various aerial photographic systems available, including different camera types and aspects of data recording (i.e. film and filters)
- Calculate basic photogrammetry measurements from aerial photographs
- Examine various optical, microwave and LiDAR remote sensing platforms, including RadarSAT, LandSAT, and ESA platforms
- Perform basic digital imagery analysis, such as radiometric and geometric corrections

GENERAL INFORMATION

Dr. John lacozza	Office: 472 Wallace Building
Phone: (204) 474-8483	Email: John.lacozza@umanitoba.ca
Office hours: Monday and Wednesday 9:30-10:30 am.	
Course website: umlearn.ca	TA: TBA

Техтвоок

<u>REQUIRED</u>: Lillesand T.M., R.W. Kiefer and J. Chipman. 2015. *Remote Sensing and Image Interpretation*. (7th Ed.) John Wiley and Sons. ISBN: 978-1-118-34328-9

PREREQUISITES

A grade of "C" or better in GEOG 1200 or GEOG 1201 (or 053.120) or GEOG 1290 or GEOG 1291 (or 053.129) and three credit hours in PHYS 1020 or PHYS 1021 (or 016.102), PHYS 1030 or PHYS 1031 (or 016.103), MATH 1300 or MATH 1301 (or 136.130), MATH 1500 or MATH 1501 (or 136.150), or written consent of the department.

EVALUATION

Midterm exam:	15%	Lab assignments:	50%
Final exam:	25%	(each assignment is worth	h 12.5%)
Class participation:	10%		

FINAL GRADE ALLOCATION

A+	90% or above	C+	65% - 69%
A	80% - 89%	С	60% - 64%
B+	75% - 79%	D	50% - 59%
В	70% - 74%	F	49% or below

STUDENT RESPONSIBILITIES

- A high level of student cooperation and participation, involving asking and answering questions during the lectures.
- Cell phones and portable music players must be turned off during lectures. Students are also required to remove earphones. NO TEXTING DURING CLASS.
- Students are required to attend all lectures and take notes. Students are expected to be punctual for classes. Not all material presented in the lectures is covered in the text. *If you miss a lecture, make arrangements to get notes from a fellow student, not from instructor!* Lecture slides will not be provided on UMLearn (the learning management tool).
- The individual student is required to read the assigned chapters of the textbook *prior to class*. Not all the textbook will be covered in the lectures but may be covered on the test or exam.
- Students are required to attend all lab times and complete the necessary assignments individually, unless otherwise stated.

COURSE POLICIES

<u>Academic Integrity</u>: Academic dishonesty (plagiarism, cheating) is a very serious matter in any academic institution and is dealt with severely at the University of Manitoba.

Plagiarism is copying another student's assignment or examination. While I strongly encourage collaboration during the lab, the assignments <u>must</u> be submitted individually, **using your own words**. If you quote other sources of information in an assignment, make sure to provide proper credit.

Cheating is the possession of an unauthorized material during the mid-term or final exam, including crib notes, texts or dictionaries. Students must not be in possession of a cell phone, iPod, iPad or any other electronic device.

Commonly, the penalty for any form of academic dishonesty is a grade of zero on the assignment, midterm or final exam, or a final grade of F in the course. Please familiarize yourself with the University policy on academic dishonesty found on the following website:

http://www.umanitoba.ca/student/resource/student advocacy/cheating plagiarism fraud.html.

<u>Audio/Video Recording</u>: Students are NOT permitted to photograph, audio or video record the lectures in entirety or any parts.

<u>Questions/Concerns</u>: If you are having a problem and want to discuss something, please feel free to see me before/after class, during my office hours or make an appointment at a more convenient time. I can be reached through phone or email (preferred method).

<u>Emails</u>: Ensure that the course name and number are included in the subject line for all emails. Please make sure emails are written in a professional manner, including complete sentences and do not use text language (I am not fluent in shorthand). Please address the email to John or Dr. Iacozza (not Buddy or any similar terms). Emails must be sent from University of Manitoba email accounts; emails from other accounts (such as gmail) will not be responded to. Emails will typically be responded to during regular office hours. You should not expect a response on weekends or in the evenings (i.e. after 4 pm).

VOLUNTARY WITHDRAWAL DATE

The voluntary withdrawal date is the last date for withdrawing from this course without academic penalty. The voluntary withdrawal date for this course is November 18, 2015. Evaluative feedback will be provided prior to this date.

TESTING

Test/exam format will include multiple choice, true-false, and/or short answer questions. These questions will be based on lectures, assigned readings and class discussion. The questions will focus on the theory behind the remote sensing principles discussed, rather than on calculations (no calculations will be on the midterm/final exam). The midterm test will be written during class time and the final exam in December during the exam period. In all tests/exams, no extraneous devices (i.e. dictionaries, cell phones, notes, textbooks, etc.) will be allowed. The final exam may be cumulative. You will need to bring a writing utensil (i.e. pencil/pen) and a form of identification (Student ID card preferred).

The student is responsible for providing written proof of either illness or compassionate distress in order to be allowed to write a make up test. Please let me know of your situation promptly and present written proof within five (5) working days. Please see list below for acceptable and unacceptable reasons for rewriting the midterm. If you miss the final exam due to illness or compassionate reasons, you must make arrangements with your own Faculty office.

LAB ASSIGNMENTS

Because remote sensing is both a tool not only for analysis, but also communication, students will be required to prepare graphical and written materials, much as would be expected in a professional setting with the same quality. Computer-based assignments will focus on the practical application of remote sensing principles discussed in class to real-world data. Four assignments will be distributed through the term and will focus on a particular concept or application discussed in class.

Assignments must be submitted as a **SINGLE WORD DOCUMENT** and electronically through UMLearn (formally D2L). The course website is available for registered students at: umlearn.ca. Your login name and password are the same as your UMnetID. Documents must be labelled with the student name, student number and assignment number. Emailed assignments **WILL NOT** be accepted at any time for any reason. If you are not familiar with this tool, please ask your instructor or TA. Assignment grades will be posted on UMLearn.

Assignments must be handed in on time – by 2:30 pm on due date. Late assignments will be given a grade of 0 unless the student has obtained TA approval in advance of the deadline.

Reasons for granting an extension (assignment or midterm): a death in your immediate family, an illness in either yourself or in a dependent (requires written note from a doctor dated BEFORE the assignment is due), and required to travel for work. The Instructor will not accept a note dated AFTER the due date.

Reasons for not granting an extension: having another assignment due at a similar time/day, being away from the university for a personal reason (i.e. holiday or personal vacation), being too busy with other course work (i.e. having a midterm that same day or week), not attending the lectures due to personal or compassionate reasons (or other reasons), car broke down and could not submit assignment on time, computer is not working properly and you lost the assignment, or any other reason deemed inappropriate by the instructor. This is not an exhaustive list. Please don't ask for an extension if any of these or similar reasons apply. If you know that you will be away, you MUST submit the assignment before the due date.

SPECIAL NEEDS

Students with disability-related needs or are experiencing difficulty should discuss issues with a councillor in one of the following Student Affairs offices as soon as possible. You can also discuss any issues with your instructor, who can direct you to appropriate institutional resources.

- Student Accessibility Services: 155 University Center, 204-474-6213, 204-474-9790 (TTY)
- Learning Assistance Center: 201 Tier Building, 204-480-1481
- Student Counselling and Career Centre: 474 University Center, 204-474-8592

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COURSE/READING SCHEDULE

LECTURE TOPIC		READINGS	
	Introduction to Course		
Introduction	What is Remote Sensing?	pp. 1-4; 30-48	
	History of Remote Sensing	pp. 86-89, 386-389	
	1		
	Wave and Particle Theory		
Electromagnetic Energy	Energy Interactions with	nn 4-30	
Licetioninghetic Licegy	Atmosphere	pp. + 30	
	Energy Interactions with Surface		
	Introduction		
	Photographic Basics		
Aerial Photography and	Photoclassification System		
Photogrammetry	Geometric Elements	pp. 59-86; 89-143	
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	Flight Planning		
	Interpretation Process		
Multispectal and Thermal	Multispectral aerial photography	pp. 218-271	
Remote Sensing	Thermal aerial photography	PP	
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Optical Remote Sensing	Satellite Image Characteristics	pp. 283-379	
	Optical Remote Sensors		
			
Microwave Remote Sensing	Microwave Theory	pp. 385-435; 443-459; 464-471	
	Active Microwave Sensors		
	Passive Microwave Sensors		
	1		
Other Systems	Hyperspectral Imaging	pp. 271-282; 598-602	
	LIDAR	pp. 4/1-485	
	PBL profiling	Supplementary reading	
	1		
Introductory Image	Image Processing	pp. 485-537	
Processing	Image Enhancement	pp. 537-591	

TENTATIVE DATES (please note that the dates may change)

Assignment	DATE	TEST	DATE
Lab #1	September 24, 2015	Midtorm	October 16, 2015
Lab #2	October 15, 2015	whaterin	
Lab #3	November 5, 2015	Final Evam	Schodulad through SDO
Lab #4	December 3, 2015		Scheduled through SRO