GEOG*2420 The Earth from Space
DEPARTMENT OF GEOGRAPHY, ENVIRONMENT AND GEOMATICS
COURSE OUTLINE - Fall 2020

1. Instructor
Ben DeVries

2. Email
bdv@uoguelph.ca

3. Office hours
Wednesdays 11am – 12:30pm or by appointment

4. Prerequisite
0.50 credits in Geography and/or Earth Science

5. Overview
This course is one of two foundational courses (the other being GEOG*2480 Mapping and GIS) in the Geomatics stream of courses offered by the Department of Geography, Environment and Geomatics. The Earth from Space provides an introduction to the fields of remote sensing and photogrammetry, focusing on the history of the disciplines and the basic data sources, techniques, and fields of application. It provides the necessary background for GEOG*3420 Remote Sensing of the Environment.

6. Course Description
This course provides an introduction to the principles and techniques of airborne and satellite image interpretation and analysis. Topics include physical principles of remote sensing, air photo interpretation, photogrammetry, types of Earth Observation satellites and applications of remote sensing. Lab exercises focus on specific applications in natural habitats and in rural and urban settings.

7. Learning Outcomes
By the end of the course, you should be able to:

- Understand the history and foundational theories behind the field of Earth Observation
- Gained a basic knowledge of the main Earth Observation systems, technologies and data sets
- Analyze imagery data using open-source GIS software
- Understand photogrammetric techniques and practices
- Identify key application areas in Earth Observation
- Practice communicating concepts through formal written and visual forms

8. Course Organization and Presentation
Lectures and labs for the F20 semester are scheduled as “remote synchronous” (AD-S). Lectures will be held on Tuesdays and Thursdays from 2:30pm to 3:50pm via Zoom video conferencing. Some of the lectures will be pre-recorded and posted on the course’s Courselink page, and a more detailed schedule of synchronous sessions will be released at the beginning of the course. In addition, each student is registered for one remote three-hour lab per week. The format of the lab sessions will be announced at the beginning of the course.
9. **Text and Other Resources**

There is no required text for this course. Some required readings may be provided via the Courselink site for this course, and will be announced throughout the course. There are many introductory Remote Sensing textbooks. One *recommended* text for this course is:


10. **Method of Evaluation**

The evaluation for this course will consist of a mid-term and final exam and lab assignments. The lab material constitutes an integral part of this course, since this is where students receive hands on work with airborne and satellite imagery, and must apply the techniques they have learned in lectures. Labs must be submitted in to the teaching assistant by the *beginning* of the lab section in the week they are due, with a late penalty of 10% of the total assignment grade per day. Lab material will be covered on both the mid-term and final exams.

11. **Grade Distribution**

- Lab Assignments: 40%
- Mid Term Exam: 30%
- Final Exam: 30%

12. **Lecture Topics and Lab Schedule**

A *tentative* schedule of lecture and lab topics by week is shown below:

<table>
<thead>
<tr>
<th>Week</th>
<th>Date (start of week)</th>
<th>Tuesday</th>
<th>Thursday</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2020-09-07</td>
<td>No lecture</td>
<td>Introduction to the course</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2020-09-14</td>
<td>Electromagnetic Radiation</td>
<td>Electromagnetic Radiation</td>
<td>QGIS Tutorial</td>
</tr>
<tr>
<td>3</td>
<td>2020-09-21</td>
<td>Image Resolution</td>
<td>Image Resolution</td>
<td>Lab 1</td>
</tr>
<tr>
<td>4</td>
<td>2020-09-28</td>
<td>Remote Sensing Platforms</td>
<td>Airborne Imagery</td>
<td>Lab 1</td>
</tr>
<tr>
<td>5</td>
<td>2020-10-05</td>
<td>Image Interpretation</td>
<td>Photogrammetry</td>
<td>Lab 2 (Lab 1 Due)</td>
</tr>
<tr>
<td>6</td>
<td>2020-10-12</td>
<td>No lecture (Fall break)</td>
<td>Photogrammetry</td>
<td>No labs</td>
</tr>
<tr>
<td>7</td>
<td>2020-10-19</td>
<td>Optical Remote Sensing</td>
<td>Optical Remote Sensing</td>
<td>Lab 2</td>
</tr>
<tr>
<td>8</td>
<td>2020-10-26</td>
<td>No lecture (Midterm Exam)</td>
<td>Hyperspectral Remote Sensing</td>
<td>No labs (Lab 2 Due)</td>
</tr>
<tr>
<td>9</td>
<td>2020-11-02</td>
<td>Microwave Remote sensing</td>
<td>Microwave Remote sensing</td>
<td>Lab 3</td>
</tr>
<tr>
<td>10</td>
<td>2020-11-09</td>
<td>Lidar Remote Sensing</td>
<td>Lidar Remote Sensing</td>
<td>Lab 3</td>
</tr>
<tr>
<td>11</td>
<td>2020-11-16</td>
<td>Applications: Vegetation</td>
<td>Applications: Vegetation</td>
<td>Lab 4 (Lab 3 Due)</td>
</tr>
<tr>
<td>12</td>
<td>2020-11-23</td>
<td>Applications: Water</td>
<td>Applications: Water</td>
<td>Lab 4</td>
</tr>
<tr>
<td>13</td>
<td>2020-11-30</td>
<td>Applications: Soils</td>
<td>Review</td>
<td>No labs (Lab 4 Due)</td>
</tr>
<tr>
<td>14</td>
<td>2020-12-07</td>
<td>No lectures (Final Exams)</td>
<td></td>
<td>No labs</td>
</tr>
</tbody>
</table>

Lab assignments will cover some material discussed in lectures, but will emphasize practical applications of remote sensing. In some cases, additional concepts may be introduced to build upon topics discussed in lectures. All assignments will be done using open-source GIS software (mostly QGIS). Assignments are
due at the beginning of lab sessions the week after they are assigned. Material covered in labs may also be included in the mid-term and final exams.

13. Laboratory Exercises
There are four equally-weighted laboratory exercises, worth a total of 30% of your final grade. Laboratory exercises will be assigned by your graduate teaching assistant (GTA) during your regular lab time. Your GTA will provide specific details about the timing and procedure for submitting each lab, but assignments are normally submitted on the due date at the start of your regular lab time. Late lab assignments will be penalized (see When You Cannot Meet a Course Requirement).

The format of synchronous lab sessions will be announced by your GTA at the beginning of the course.

14. Laboratory Times

- 0101 Mon  02:30PM – 04:20PM
- 0102 Wed  02:30PM – 04:20PM
- 0103 Wed  11:30AM – 01:20PM
- 0104 Fri  09:00AM – 11:20AM

15. Laboratory Fee
There are no laboratory or printing fees associated with this course. All lab assignments are to be submitted in digital format to folders that will be set upon the Courselink page for this course.

16. Exam Format
There will be one mid-term and one final exam in this course. The official dates for Mid-term is Thursday, October 26th, and the Final exam is scheduled for the week of December 7th. The format of the exams is described below. The mid-term and final exams will include some material included in the labs.

The mid-term and final exams will be assigned as open-book exams. For the mid-term, a “window” of approximately 3 days (exact timing to be confirmed closer to the date of the exams) will be scheduled. During this window, you may decide when to begin the exam, which will be hosted on the Courselink site for this course. Once you begin, you will have a specific time limit to finish and submit the exam. You will only be allowed one attempt to write the exams and you may not stop and start the exam once you begin. You are expected to do your own work and you will not be allowed to collaborate with your classmates or anyone else when writing the exam. Each exam will be unique, with questions drawn from a pool of questions.

17. Final Exam Date
The final exam will be assigned as a an online, open-book exam. The exam will be made available on Courselink at 10am Monday, December 7th and must be written and submitted via Courselink by no later than 4pm on Friday, December 11th.

18. Disclaimer
Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website and circulated by email.
19. Illness
The University will not require verification of illness (doctor’s notes) for the fall 2020 or winter 2021 semesters.

20. Territorial Acknowledgements
We acknowledge that the University of Guelph resides on the ancestral lands of the Attawandaron people and more recently, the treaty lands and territory of the Mississaugas of the Credit. We recognize the significance of the Dish with One Spoon Covenant to this land and offer our respect to our Anishinaabe, Haudenosaunee and Métis neighbours as we strive to strengthen our relationships with them.

Today, this gathering place is home to many First Nations, Métis and Inuit peoples and acknowledging them reminds us of our important connection to this land where we learn and work.

21. E-mail Communication
As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

22. When You Cannot Meet a Course Requirement
Late assignments will be assessed a penalty of 10% per day (not including weekends). After the graded assignment has been handed back to the class no grade can be assigned on late work.

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.

23. Drop Date
The last date to drop one-semester courses, without academic penalty, is Friday, December 4th, 2020. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar.

24. Copies of out-of-class assignments
Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

25. Accessibility
The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community’s shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services (SAS) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/

26. Academic Misconduct
The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be
aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. **An example of academic misconduct that might occur in this course is a student copying an answer or using a map/image from another student. Students must create their own digital files for computer-based exercises.** University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

**The Academic Misconduct Policy is detailed in the Undergraduate Calendar.**

**27. Recording of Materials**

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

**28. Resources**

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.