I. Course description: Aerial photography and digital remote sensing; visual interpretation of land use, landforms, and surficial materials; introduction to digital image processing and analysis.

II. Preclusions: GEOG3002 (no longer offered)

III. Learning Outcomes:

- Understand the conceptual and technical background related to image formation and spectral reflectance theory, types of remote sensors currently in use
- Use theoretical understanding to determine the appropriate sensor to observe specific geographic phenomenon
- Perform visual interpretation of images, image enhancement, thematic mapping using remotely sensed imagery
- Use theoretical understanding to determine the best workflow for processing and analyzing remotely sensed imagery

V. Course calendar *(tentative: dates and topics subject to change)*:

<table>
<thead>
<tr>
<th>Lecture date</th>
<th>Lecture Topic</th>
<th>Lab name</th>
<th>Due in Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 5</td>
<td>Welcome + introduction to course + review of raster image formats</td>
<td>Lab 1: introduction to imagery</td>
<td>none</td>
</tr>
<tr>
<td>September 12</td>
<td>Optical remote sensing 1: Introduction to electromagnetic radiation and spectral reflectance in remote sensing.</td>
<td>Lab 2: optical remote sensing</td>
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<tr>
<td>September 19</td>
<td>TBD</td>
<td>Lab 2: optical remote sensing</td>
<td>Lab 1: introduction to imagery</td>
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<tr>
<td>September 26</td>
<td>Optical Remote Sensing 2: Introduction to digital imagery, colour infrared composite and pseudo colour display, spectral analysis of land cover types, histogram analysis, contrast enhancement, edge enhancement and noise reduction.</td>
<td>Lab 2: optical remote sensing</td>
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<tr>
<td>Oct 3</td>
<td>Optical Remote Sensing 3: applications and advanced analysis</td>
<td>Lab 2: optical remote sensing</td>
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<tr>
<td>October 10</td>
<td>SAR remote sensing: basics of microwave remote sensing</td>
<td>Lab 3: SAR</td>
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<tr>
<td>October 17</td>
<td>LiDAR and other active sensors</td>
<td>Lab 4: LiDAR</td>
<td>Lab 3: SAR</td>
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<tr>
<td>October 24</td>
<td>Fall break</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>October 31</td>
<td>mid term test</td>
<td>Lab 4: LiDAR</td>
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<tr>
<td>November 7</td>
<td>Supervised classification for thematic mapping of Land cover / Land use. Accuracy assessment of thematic maps.</td>
<td>Lab 5: Image Classification</td>
<td>Lab 4: LiDAR</td>
</tr>
<tr>
<td>November 14</td>
<td>Structure from Motion and UAV photogrammetry</td>
<td>Lab 6: SfM</td>
<td>Lab 5: Image Classification</td>
</tr>
<tr>
<td>November 21</td>
<td>Google Earth Engine, data cubes, Cloud based computing and the future of remote sensing</td>
<td>Final project</td>
<td>Lab 6: SfM</td>
</tr>
<tr>
<td>November 28</td>
<td>Remote Sensing applications 2 (guest lecture?)</td>
<td>Final project</td>
<td></td>
</tr>
<tr>
<td>December 5</td>
<td>last class wrap up</td>
<td>Final project</td>
<td></td>
</tr>
</tbody>
</table>

VI. Evaluation:
6 labs @ 8% each  
mid term @ 20%  
6 quizzes @ 2% each
Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

**Late Policy:** A hard copy of all lab assignments must be handed in to your TA or instructor no later than the **BEGINNING** of the scheduled meeting on the assignment due date, unless otherwise stated on the assignment sheet or syllabus. **No late assignments will be accepted**, with the exception of those accompanied by a doctor's note or if you have already arranged for an academic accommodation as described in subsequent sections of this syllabus. In such cases you must make arrangements with the course instructor at least 24 hours prior to the due date and provide 3rd party documentation to her within 5 days of the due date verifying the particular circumstance leading to the late submission. It is your responsibility to ensure that the instructor or TA receive your submitted hard copies. If you are unable to submit an assignment in person, it is recommended that you email the instructor or TA with a digital version in addition to a hard copy left in the assignment drop-slot on the door of the departmental mail room. However, this option should only be considered as a last resort.

**Lecture/Lab attendance:** While attendance to the workshop is not recorded, it is highly recommended that you attend all sessions. Lectures will cover theoretical components of remote sensing and may also include software demonstrations. Labs will include software demonstrations and one-on-one help will be available for software and practical related questions.

**VII. Statement on Plagiarism**

**PLAGIARISM**

The University Senate defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This can include:

- reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another’s data or research findings;
- failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
- handing in "substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs."
Plagiarism is a serious offence that cannot be resolved directly by the course’s instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

VIII. Requests for Academic Accommodations
Please include the following text, provided by Equity Services, on all course outlines, and read it at the beginning of your first few classes to remind students. For details, see the Instructors’ Guide to Academic Accommodation

Guide to Academic Accommodation

Academic Accommodation
You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist.

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist.

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Survivors of Sexual Violence
As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/equity/sexual-assault-support-services

Accommodation for Student Activities
Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist.