Course Information

Course Title	Course Code Number	Credit Value
Geomatics in Forestry: Data Collection and Management	FODE 009	3 credits
Prerequisites		
No prerequisites.		
Corequisites		
None.		

Contacts

Course Instructor(s)	Contact Details	Office Location	Office Hours
TBD	TBD	TBD	TBD
Other Instructional Staff			
TBD			

Course Description

Demand for professionals with careers focused on *the environment, conservation and sustainability (green-jobs)* continues to grow at ever increasing rates. All of these careers require a diversity of skills, however among the most important are skills focused on geomatics, mapping and spatial data analysis. Designing forest conservation zones, management for endangered species, sustainable forestry practices, urban greenspace corridors, and locating re-greening sites for carbon mitigation all require knowledge and skills in acquiring, analyzing, processing and displaying geo-spatial data.

Geospatial information such as forest inventories, satellite, aircraft and Unmanned Aerial vehicle (UAV or drone) imagery, digital terrain models, plot-based field records, climate models, or road and stream networks are ubiquitous; yet specific skills to handle and process the information, and analytical approaches to translate these data into relevant applications for policy, science, or operations are needed. In particular remote sensing and Geographic Information Systems (GIS) software and algorithms allows analysis of spatial location data quickly and efficiently. Remote sensing provides highly detailed 2 and 3D data on terrestrial, atmospheric and oceanic conditions. Geo-positioning technologies, specifically Global Navigation Satellite Systems (GNSS) result in extremely accurate locational services. Advances in the miniaturization and capacity of hard and soft computing technologies

provide storage and communication capacities. It is important that students develop informed skills in all of these areas.

Whether you have previous geomatics experience or not, this course is designed for students to introduce themselves to the core concepts of geomatics through analyzing spatial data using several different tools. We hope to inspire you with the capabilities of GPS, remote sensing and GIS so that you can start thinking about the next generation of spatial analysis and how it might be applied in the future.

Target Audience

Managers, and researchers interested in the application of state-of-the-art geospatial tools for forest monitoring and mapping.

Delivery Format

This course is designed to be a fully online course with an option to issue a graduate-level course completion certificate. Course content such as readings and fundamental concepts will be offered as open educational resources for Asian-Pacific region. The entire or 'parts of' the course are welcome to be repurposed in other current and future courses and programs to support flipped, blended, and online learning. It will follow a format which typically include presentations, mini videos, automatically graded tests, and moderated online discussions on weekly basis.

In the case of self-directed learning, students will learn through light moderated online discussions facilitated by student volunteers or TAs and through self-review activities found at the end of each learning topic. In the case of certificate learning, students will learn through scheduled instructor-facilitated sessions and discussions and will actively engage with instructors, TAs, and their peers to complete all graded assignments to earn the certificate. Course completion certificates will be issued after students successfully pass the **course.** Students can access all course materials, presentations, videos, assignments, and tutorials online through UBC Canvas System.

Learning Outcomes

The overall goal of this course is to introduce the fundamental concepts of geo-spatial analysis and provide an understanding of spatial technologies and how they can be applied.

Having completed this course, the student should be able to:

- Describe the basics of Earth observation and how satellite systems and GPS work to define position on Earth.

- Explain the electromagnetic spectrum, radiation fundamentals, spectral signatures and how these concepts can be applied in the world of remote sensing and forestry.
- Discuss the different kinds of resolutions and orbits, and be able to analyze the trade-offs and relationships that exist when considering different sensors.
- Analyze different kinds of raster and vector data and apply this to measuring environmental change over time.
- Visualize point clouds and apply LiDAR data to analyze forest structure and terrain models.
- Evaluate challenges and limitations of geo-spatial analysis and where the future of Earth observation is headed.

Learning Materials

No textbooks required. Each lecture is accompanied by recommended readings and online videos.

Learning Approach & Activities

This course examines how innovative earth observation and other geospatial technologies allow us to better understand the changing Earth, including how humans are impacting the planet and interacting with the environment and each other. The course will cover a range of space-based technologies such as the use of remote sensing, global positioning systems, location-based services, virtual globes (like GOOGLE EARTH), web-based mapping and big-data geospatial analysis. A range of environmental change applications will be covered and the use of remote sensing and GIS to examine these changes demonstrated. Focus will be on forest cover and change. The course will introduce computer-based skills and techniques for spatial thinking, image interpretation, and environmental decision-making as well as time for reflection on the images and how they can be used to inspire the general public.

Course Topics

A series of 26 lectures online including class exercises, access to imagery and analysis tools, class forum, assignment submission, assigned readings and videos. A mid-term and a final exam will be used for assessment.

The course will be divided into 5 main Modules and within each a series of online Topics. Each Topic will be supplemented with videos, animations, quizzes and interactive websites.

Module 0: Course Orientation

Course outline/syllabus and requirements

Module 1: Where I am?
- Topic 1.1: Defining Position and Measuring Aspects of Earth
- Topic 1.2: Types of Satellite Navigation Systems
- Topic 1.3: Intro to GIS & Basic GIS Operations

Module 2: What can I see?
- Topic 2.1: The Basics of the Electromagnetic Spectrum
- Topic 2.2: Remote Sensing and Spectral Signature

Module 3: How can I see?
- Topic 3.1: Resolutions in Remote Sensing & Orbits and Sensors
- Topic 3.2: Active Sensors

Module 4: How do I analyze it?
- Topic 4.1: Remote Sensing Imagery Analysis
- Topic 4.2: Temporal Image Analysis
- Topic 4.3: Raster Modelling & Map-making and Visualization
- Topic 4.4: Digital Aerial Photographs
- Topic 4.5: LiDAR Data Processing

Module 5: Looking Ahead
- Topic 5.1: Human Footprint & Big Data

Course Wrap-up
- Review/wrap up and summary

Course Schedule

For self-directed learning students, you can complete the topics and modules at your own pace. The speed at which you progress through the course will depend on a number of factors, including how well you can understand English, how much you already know about the topics.

For certificate learning students, you are expected to follow the schedule below to participate in all instructor-facilitated course activities and complete all course assignments by specified due dates.

Note that all deadlines, dates and times are given in Pacific Standard Time (PST). Contact your instructors to discuss any adjustment needed to accommodate your time zone

Start Week	Topic	Core Concepts	Learning Activities	Assignment Dues
1 Day 1-7	**Course Orientation**	Course syllabus Course schedule Course requirements Assignment details	• Review course introduction and overview materials.	

			• Familiarize yourself with course platform and tools. • Ask any questions of general requirements for the course on class discussion board.	
Module 1: Where I am				
2 Day 1-7	**Topic 1.1:** Defining Position and Measuring Aspects of Earth	Defining your position on Earth, defining the shape of the Earth. Explaining projections, scale and the information represented in maps & images.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 1	
3 Day 1-7	**Topic 1.2:** Types of Satellite Navigation Systems	The GNSS and satellite navigation. What information is needed to define location from space and how GPS works. Other existing satellite navigation systems and applications. What differential and kinematic GPS is and how GPS is used in forests.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 2	Assignment 1 due by 11:59pm on Friday of this week.
4 Day 1-7	**Topic 1.3.:** Intro to GIS & Basic GIS Operations	How to represent spatial data and the different types of data in GIS. Explain concepts and procedures behind basic GIS operations. Common errors in GIS and modelling basics	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 3	Assignment 2 due by 11:59pm on Friday of this week.
Module 2: What can I see?				

5 Day 1-7	**Topic 2.1:** The Basics of the Electromagnetic Spectrum	Radiation fundamentals and understanding the electromagnetic spectrum. Explaining the major wavelengths we use to view the Earth and the different types of radiation from the sun. Atmospheric and surface interactions of radiation.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 4	Assignment 3 due by 11:59pm on Friday of this week.
6 Day 1-7	**Topic 2.2:** Remote Sensing and Spectral Signatures	Explaining what a spectral signature is and what it looks like for several basic Earth surfaces. Explaining the dominant factors controlling leaf reflectance and understanding spectral signatures of leaves. Defining vegetation indices and how they can be applied.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz	Assignment 4 due by 11:59pm on Friday of this week.
Module 3: How can I see?				
7 Day 1-7	**Topic 3.1:** Resolutions in Remote Sensing & Orbits and Sensors	Explaining what resolutions are important to consider in Earth observation. Defining the different resolutions, explaining why they are important to consider and evaluating trade-offs. Describing scanner types and explaining the concept of orbits. Current and future sensors and their attributes.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 5	

8 Day 1-7	**Topic 3.3:** Active Sensors	Evaluating the difference between passive and active sensors. Explaining RADAR, LiDAR and their applications.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz	Assignment 5 due by 11:59pm on Friday of this week.
Module 4: How do I analyze it?				
9 Day 1-7	**Topic 4.1:** Remote Sensing Imagery Analysis	Applying spectral channels to colour guns, basic image enhancement and spatial filters. Explaining land-cover vs. land-use. Unsupervised and supervised classification: concepts, procedures, pros and cons. Explaining error and understanding accuracy assessments.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 6	
10 Day 1-7	**Topic 4.2:** Temporal Image Analysis	Why environmental change is important to monitor and how geo-spatial data can detect it. The types of changes that can be observed and how they differ. Applications of temporal image analysis.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz	Assignment 6 due by 11:59pm on Friday of this week.
11 Day 1-7	**Topic 4.3:** Raster Modelling & Map-making and Visualization	Terrain surface parameters, curvatures in landform classification, spatial interpolation of raster models in GIS and applications of rasters and terrain models. Types of maps, cartographic design,	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz	

		symbolization and 3D visualization.		
12 Day 1-7	**Topic 4.4:** Digital Aerial Photogrammetry	The difference between airborne and satellite imagery. Scale and digitization of imagery / Digital Aerial photogrammetry	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz	
13 Day 1-7	**Topic 4.5:** LiDAR Data Processing	Introduction to FUSION and visualizing point clouds. LiDAR applied to terrain visualization and DEM's. LiDAR applied to forest structure at different scales.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 7	
Module 5: Looking Ahead				
14 Day 1-7	**Topic 5.1:** Human Footprint and Big Data	Explaining the "human footprint," how bit it is, and how geospatial data technologies can be used to measure it. What big data is, and when/why it becomes big. Limitations and challenges of big data. What an observation for an information network is and how information networks contribute to Earth observation. Challenges/opportunities and where we are heading.	• Watch PPT • Watch video • Reading material • Post on class forum • Complete practice quiz • Start assignment 8	Assignment 7 due by 11:59pm on Friday of this week.
15 Day 1-7	**Course Wrap-up**	Review/wrap up and summary	• Final Exam • Other?	Assignment 8 due by 11:59pm on Friday of this week.

				Final Exam due by xx:xx on day X of this week.

Course Certification

This is a course with an option to obtain certification for a 3-credit graduate-level course. Students would need to decide whether to pursue a certificate by end of Week 2 of the course. The number of certificate learning students for each offering of the course would be capped at 100. Assessments to student certification include the following components. Each component must be passed to successfully complete the course to get the course certificate. The passing grade is 60%.

Components	Points/Marks	Weight
Forum Discussions (13)	5 each x 13 = 65	10%
Assignments (8)	10 each x 8 = 80	40%
Mid-term	50	25%
Final	100	25%

Final letter grades will be given based on the following grading schema:

Letter Grade	Range
A+	90% - 100%
A	85% - 89%
A-	80% - 84%
B+	76% - 79%
B	72% - 75%
B-	68% - 71%
C+	64% - 67%
C	60% - 63%
F (Fail)	0% - 59%

Late Assignment Policy

In general, submitting assignments after the specified completion date is not considered acceptable for university students. However, in the event that a student cannot submit an assignment on the specified completion date, late work will be accepted only if it has been date stamped by the Dean's office. **Late work will NOT be accepted after five days past the due date and 10% will be deducted per day.** This means WEEKDAYS, NOT class meetings. In

extreme cases of personal misfortune this policy can be extended ONLY by special arrangement with the instructors.

Participation Expectations

Self-learning students may study at their own pace. However, certificate learning students are encouraged to be engaged in discussions with classmates and seek help from their instructors on any academic material. Study time is allocated at your own discretion, but you must participate in online discussions and complete assignments on time according to the schedule.

Netiquette Expectations

Netiquette is the practical code for conducting yourself while working and communicating in an online environment. The following expectations are some general netiquette guidelines to abide by when participating in the online forum discussions.

1. Hold yourself to the same behavioral standards online that you follow in real life and in a real classroom.
2. Know where you are in cyberspace and understand who will be able to view what you post.
3. Respect other people's time and bandwidth:
    a. Take the time before hand to review the requirements of the discussion.
    b. Contribute meaningful answers and questions that are relevant to the topic.
    c. Refrain from disagreements that lead to emotionally-charged arguments and work to dissolve these conflicts.
    d. Use concise language.
4. Act in a professional manner:
    a. Check your spelling and grammar and ensure you are clearly conveying your message.
    b. Avoid using slang terms.
    c. Refrain from inappropriate manners and remarks.
    d. Always be respectful.
5. Share your knowledge, forgive mistakes, and be patient and compassionate towards all learners in the course.
6. If you disagree with someone, express your opinion in a constructive way with the goal of increasing everyone's knowledge.
7. Do not shout (CAPITALS MEAN THAT YOU ARE SHOUTING).

8. Respect people's privacy by not sharing or spreading inappropriate information. If it seems sensitive information was posted accidentally, let that person know in private.
9. Be cautious using humor or sarcasm as your tone is often lost in a forum post.
10. Don't repeat someone else's post without adding something of your own and always reference information when appropriate.

Adapted from: https://www.duq.edu/about/centers-and-institutes/center-for-teaching-excellence/teaching-and-learning/netiquette-for-online-learning

Academic Integrity

UBC is an academic community in which commitment to the principles of truth and academic honesty is essential. The Code of Academic Integrity prohibits students from committing the following acts of academic dishonesty:

1. Cheating: intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
2. Fabrication: intentional and unauthorized falsification or invention of any information or citation in any academic exercise.
3. Facilitating academic dishonesty: intentionally or knowingly helping or attempting to help another violate any provision of the Academic Code.
4. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise.

ANY PLAGIARISM will result in a mark of zero for the assignment/exam. As a student, you are expected to submit original work and give credit to other people's ideas and writing. Plagiarism includes copying other people's ideas or writing without citing the source. If a quotation is used, it must be identified as a quotation and correctly cited. **Plagiarism is considered a very serious issue and can affect your career**.

Please make sure you know UBC's policies on plagiarism and read tips for avoiding it (see http://help.library.ubc.ca/planning-your-research/academic-integrity-plagiarism/).

For additional guidance on what plagiarism is and how to avoid it, please see:

UBC Calendar: http://www.calendar.ubc.ca/Vancouver/index.cfm?tree=3,54,111,959

UBC Learning Commons, Avoiding Plagiarism: http://learningcommons.ubc.ca/resource-guides/avoiding-plagiarism/

Other Course Policies

Learning Analytics

Learning analytics includes the collection and analysis of data about learners to improve teaching and learning. This course will be using the following learning technologies: Canvas, etc. Many of these tools capture data about your activity and provide information that can be used to improve the quality of teaching and learning. In this course, I plan to use analytics data to:

- View overall class progress
- Track your progress in order to provide you with personalized feedback
- Review statistics on course content being accessed to support improvements in the course
- Track participation in discussion forums
- Assess your participation in the course

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