

REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) KNOWLEDGE REQUIREMENTS

WINTER 2023

GEOG 270 / AVIA 270

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CLASS SCHEDULE

Section	Location	Time	Instructor(s)
GEOG 270 001 [LEC]	QNC 2501	Wednesdays 8:30 a.m. - 10:20 a.m.	Derek Robinson dtrobinson@uwaterloo.ca
AVIA 270 001 [LEC]		Wednesdays 8:30 a.m. - 10:20 a.m.	

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INSTRUCTOR / TA INFORMATION

Office hours 11:00am-12:00 pm Mondays

COURSE DESCRIPTION

Calendar Description for GEOG 270

Students will gain knowledge about the requirements and constraints affecting recreational, commercial and research RPAS (Unmanned Aerial Vehicles [UAV], Unmanned Aircraft Systems [UAS]) flights for geomatics applications. Theory and conceptual factors affecting flight, remote sensing, and spatial analysis with very-high resolution data will be discussed. Students will gain knowledge about how to navigate regulatory requirements. They will learn how to link their science and research objectives with geomatics skills to mitigate risk and obtain regulatory approval for legal RPAS flights. Assignments provide a range of experiences to students that may include: applied aspects of flight campaign approval, setup, management; flight training; and integrating imagery with geographic information systems.

Calendar Description for AVIA 270

Students will gain knowledge about the requirements and constraints affecting recreational, commercial and research RPAS (Unmanned Aerial Vehicles [UAV], Unmanned Aircraft Systems [UAS]) flights for geomatics applications. Theory and conceptual factors affecting flight, remote sensing, and spatial analysis with very-high resolution data will be discussed. Students will gain knowledge about how to navigate regulatory requirements. They will learn how to link their science and research objectives with geomatics skills to mitigate risk and obtain regulatory approval for legal RPAS flights. Assignments provide a range of experiences to students that may include: applied aspects of flight campaign approval, setup, management; flight training; and integrating imagery with geographic information systems.

Antireq: GEOG 374 001 S17; AVIA 374 001 S17

Estimated additional costs:

\$20 for Transport Canada testing

\$90 for course textbook - optional

Unmanned: Textbook for UAS Studies, 2017 or newer. Aviation Publishers Co. Ltd., Ottawa, Ontario.

LEARNING OUTCOMES

By the end of this course students should be able to:

Acquire and explain the knowledge required to pass the Transport Canada small RPAS Basic and Advanced tests, required for RPA flights in Canada

Identify when a Special Flight Operations Certificate (SFOC) is required and describe the content required for a successful SFOC application.

Design effective flight campaigns to achieve project objectives, abide by regulations, and minimize flight time.

Assess potential RPAS applications to determine if the advantages of RPAS flight and data acquisition are justified.

TENTATIVE COURSE SCHEDULE

Date	Lecture and Lab Content	Assignments
Jan 11	Introduction to course, beginning of RPAS, and regulatory oversight (in-class Lecture)	
Jan 18	RPA Classification, regulations, advanced regulations (in-class Lecture)	Assignment 1: Intro to regulations (Due Jan 24th)
Jan 25	Introduction to Assignment 2 (on Teams live), Flight Mechanics and Theory of Flight (recorded Lecture)	Assignment 2: SFOC (Due Feb 6th)
Feb 1	ROC-A and Aerodrome Communications (in-class Lecture)	
Feb 8	ROC-A test (in-lecture session) Aviation Weather (pre-recorded, no in-person class)	Assignment 3 – Reading Flight Charts (Due at the end of the Lab session)

Feb 15	Small Basic RPAS Test (in-Lab session) Use lecture time to study.	
Feb 22	READING WEEK	
Mar 1	Flight Planning, Introduction to SfM and LiDAR (in-class Lecture)	Assignment 4: Flight planning (Due March 14th)
Mar 8	Hands-on flights in Gym 3 at Columbia Ice Fields	Assignment 5 (Due Mar 8th)
Mar 15	Work on Flight Planning Assignment	Weather permitting Outdoor Scenario (Assignment 7). If raining then March 22 and if also raining that day then March 29th. Due on the same day as Scenario.
Mar 22	Air Navigation, Navigation Aids, and NOTAM (pre-recorded) (in-class) Guest speakers from four different companies. Terresky, GHD, Sky Sight Aerial Solutions, and Drone Spray Canada. Presentations followed by Q&A.	
Mar 29	Aerodromes, Airspace, and Air law, (pre-recorded)	Assignment 6: Content Quiz
Apr 5	Test: Small Advanced RPAS Exam or Equivalent (in-Lab session)	

TEXTS / MATERIALS

Title / Name	Notes / Comments	Required
Unmanned: Textbook for UAS Studies, 2017. Aviation Publishers Co. Ltd., Ottawa, Ontario.	May be available for purchase at the campus book store, Hammond Aviation, and on loan at Porter Library (Book Stacks. 6th-10th Floors UG1242.D7 C36x 2017)	No

STUDENT ASSESSMENT

Tests

Component	Value
Radio Operators Certificate for Aeronautics Exam or Equivalent	10%
Small RPAS Basic Exam or Equivalent	15%
Small RPAS Advanced Exam or Equivalent	25%

Assignments

Component	Value
A1. Introduction to flight regulations	10%
A2. Special flight operations certificate critique	10%
A3. Reading flight charts	5%
A4. Flight planning	10%
A5. Hands-on flight	5%
A6. Content quiz	5%
A7. Flight scenario (outdoor, weather permitting)	5%

Tests

It is encouraged, and will be discussed in Lecture 1, that students do not take the tests prior to their in-class date of examination. Alternative tests will be provided for those who have already completed Transport Canada and Industry Canada Tests. Aviation students with an ROC-A will have an alternate assignment option.

Late submissions

Assignments 1, 2, 4, and 6 will be subjected to a 10% reduction for each day that they are late up to 5 days and then a value of zero will be assigned for the entire assignment. Assignments 3, 5, and 7 are in-class events that can not be rescheduled with failure to attend resulting in a value of zero.

ASSIGNMENT SCREENING

Text matching software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all material and sources in assignments is documented and original. In the first week of the term, details will be provided about the arrangements for the use of Turnitin and alternatives in this course. See Administrative Policy below for more information and links.

ADMINISTRATIVE POLICY

Community of Learners

A goal for this course is that we shall all contribute to a climate that promotes a Community of Learners. This includes participating in an instructional environment that promotes respect, interaction, and communication. Respectful language and behaviour are expected of all students during classes and class discussions.

Please Note: In a community of learners, diversity of opinion is respected. Class discussions, group exercises, etc., should reflect respect for others' opinions. If you anticipate an emergency during the class meeting that will require the

activation of your cell phone and/or device please speak with the instructor before class. Otherwise, please respect the instructional environment that is interrupted if cell phones or devices are activated.

Intellectual Property: For further information on IP related to teaching, please see https://uwaterloo.ca/legal-and-immigration-services/sites/ca.legal-and-immigration-services/files/uploads/files/volume_1_issue_3_winter_2018.pdf (https://uwaterloo.ca/legal-and-immigration-services/sites/ca.legal-and-immigration-services/files/uploads/files/volume_1_issue_3_winter_2018.pdf) and the Guidelines for Faculty, Staff and Students Entering Relationships with External Organizations Offering Access to Course Materials, <https://uwaterloo.ca/secretariat/faculty-staff-and-students-entering-relationships-external> (<https://uwaterloo.ca/secretariat/faculty-staff-and-students-entering-relationships-external>) . The following text is recommended:

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

Anti-racism Statement: The University of Waterloo does not tolerate racism or any other form of discrimination and expects campus community members to contribute to a culture where all members feel safe and valued. Any member of the campus community who has experienced racism or discrimination at the University is encouraged to seek guidance from the Office of Equity, Diversity, Inclusion & Anti-racism (EDI-R) via email at equity@uwaterloo.ca (<mailto:equity@uwaterloo.ca>) or through their website: uwaterloo.ca/human-rights-equity-inclusion/about/equity-office3

Co-op interviews and class attendance: Co-op students are encouraged to try and choose interview time slots that result in the least amount of disruption to class schedules. When this is challenging, or not possible, a student may miss a portion of a class meeting for an interview. Instructors are asked for leniency in these situations; but, a co-op interview does not relieve the student of any requirements associated with that class meeting.

When a co-op interview conflicts with an in-class evaluation mechanism (e.g., test, quiz, presentation, critique), class attendance takes precedence and the onus is on the student to reschedule the interview. CEE provides an interview conflict procedure to manage these situations.

Students will be required to provide copies of their interview schedules (they may be printed from WaterlooWorks) should there be a need to verify class absence due to co-op interviews.

Declaring an absence: Regardless of the process used to declare an absence, instructors maintain agency over decisions regarding course component accommodations.

Self-declared absences (for flu-like illness, short-term 48 hour self declared absences) must be submitted through Quest.

Absences requiring documentation (e.g. Verification of Illness Form, bereavement, etc.) - send your documentation to env-vif@uwaterloo. Do not send documentation to your advisor, course instructor, teaching assistant, or lab coordinator. Submission to env-vif@uwaterloo.ca () will notify all of your instructors of your absence. Students taking courses in Arts that require accommodation, should reach out to those instructors independently.

Mental Health: The University of Waterloo, the Faculty of Environment and our Departments/Schools consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. **Please note that help is available.** Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services <https://uwaterloo.ca/campus-wellness/> (<https://uwaterloo.ca/campus-wellness/>) is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

All students are encouraged to download the WatSAFE app which is available free through the google and iOS app stores. The WatSAFE app provides on- and off-campus contacts for students in distress, including international students, and other information related to campus safety and security.

Religious Observances: Students need to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

Communications with Instructor and Teaching Assistants: All communication with students must be through either the student's University of Waterloo email account or via LEARN. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.

Recording lecture: Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course. If allowed, video recordings may only include images of the instructor and not fellow classmates. Posting of videos or links to the video to any website, including but not limited to social media sites such as: facebook, twitter, etc., is strictly prohibited.

UNIVERSITY POLICY

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) . When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) (<https://uwaterloo.ca/academic-integrity/>) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) . For typical penalties, check [Guidelines for the Assessment of Penalties](https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties) (<https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties>) .

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>) (other than a petition) or [Policy 71, Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72, Student Appeals](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72) (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72>) .

Note for students with disabilities: [AccessAbility Services](https://uwaterloo.ca/disability-services/) (<https://uwaterloo.ca/disability-services/>) , located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.