GEOG / AVIA 270

RPAS Knowledge Requirements

Spring 2019

Instructor:	Derek T. Robinson
Room:	EV1-105a
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Office hours:	TBD
Lecture:	EV3 4408, 12:30 – 2:20 Tuesdays
Labs:	EV2 1002, 12:30 – 2:20 Tuesdays
Course Number:	4760/4763
Course Credits:	0.5
Prerequisites:	None

Estimated additional costs: $50 for testing $70 for course textbook

Teaching Assistant:	Adem Okal
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Office Hours:	TBA

Course Description

The proliferation of sales and use of unmanned aerial vehicles has fostered innovative applications, novel remote-sensing techniques and data analysis, and simultaneously has created concerns for air-traffic management and privacy. Students in this course will gain substantive knowledge about the requirements and constraints affecting recreational as well as commercial and research remotely piloted aircraft system (RPAS) flights for geomatics applications and research. Theory and conceptual factors affecting flight, remote sensing, and spatial analysis with very-high resolution data will be discussed in lectures. In addition to the science, students will gain knowledge about how to navigate the regulatory requirements and how to link their science and research objectives as well as harness their geomatics skills to mitigate risk and communicate objectives to aid the acquisition of special flight operating certificates or other regulatory RPAS-flight requirements. Finally, assignments will be used to emphasize these aforementioned components and give students experience with applied aspects of flight campaign approval, setup, management, and success.

Learning Objectives

At the end of this course, you should:

- Demonstrate their understanding of and awareness of the requirements for RPAS flight and the successful acquisition of special flight operating certificate or other civil or governmental evaluation and testing requirements for commercial and research RPAS flights.

- Prepare for the successful completion of the TC small Basic and Advanced tests, which are time limited tests required for legal UAV flight.
- Design flight campaigns that integrate aviation restrictions and science objectives by understanding the relationship between flight planning and sampling design with the geomatics tools and software available to manage, manipulate, and analyze data collected from RPAS flights.
- Critically evaluate potential research applications of RPASs to determine if the advantages of RPAS flight and data acquisition are justified, advance science, and can be achieved under current hardware, software, and regulatory constraints.

Required Text

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

Available for purchase at the campus book store (approximately $65) or at Porter Library 1 day loan.

Available at University of Waterloo Library UW Porter. Book Stacks. 6th-10th Floors. (UG1242.D7 C36x 2017)

Schedule

The course comprises a 2-hour lecture followed by a dedicated lab. Attendance will be recorded and will be included in the evaluated grade. The lecture will be used to introduce the theory and concepts behind RPAS flight, meterology, airspace, and regulations among other content. The lab session will be used to provide hands on experience developing skills related to navigating the regulatory requirements to gain legal approval for RPAS flight as well as setting up flight plans using geographical information systems, RPAS flight planning software, and spatial analysis of flight data. Significant additional time will be required for independent study to complete assignments and develop necessary skills (e.g., acquire Radio Operators Certification). The schedule of course content and labs are subject to change. If a change is made an updated version of the schedule or due date will be posted on the course website and students will be notified via the course website and in class.

Date	Contents	Reference Material
May 7	Introduction to Unmanned Aircraft Systems	Unmanned – Chapter 1; Small RPAS Definitions and Best Practices
May 14	Transport Canada Regulations and SFOCs	AC 600-02; AC 600-004; SI No. 623-001;
May 21	(adv) Radiocommunications – Guest Lecture	A Unmanned – Chapter 7; Study Guide for the Restricted Operator Certificate With Aeronautical Qualification; AIM-2015-1 pages 95-101C 600-02; AC 600-004; SI No. 623-001;

May 28	ROC-A Examination, Getting RPAS data into GIS	AC 600-02; AC 600-004; SI No. 623-001;
June 4	Flight Mechanics and Theory of Flight,	Unmanned – Chapter 2, 3; Knowledge Requirements to Pilot RPASS pages 19-34
June 11	Aviation Weather	Unmanned – Chapter 5; Knowledge Requirements to Pilot RPASS pages 14-18;
June 18	Air Navigation, Navigation Aids, and NOTAM (Lecture and Lab)	Unmanned – Chapter 6; AIM-2015-1 pages 377-378, 380-384; Knowledge Requirements to Pilot RPASS pages 10-13;
June 25	Review and Small Basic Test	
July 2	Best Practices for flight and Geomatics	Flying at Columbia Icefields
July 2	(adv) Aerodromes, Airspace, and Air law	Unmanned – Chapter 4; AIM-2015-1 pages 190-200; Knowledge Requirements to Pilot RPASS pages 1-9;
July 9	(adv) Airspace Continued.	Aeryon Pilot Operating Manual
July 16	Flight Planning and Mission Control Software	Unmanned – Chapter 4;
July 23	Small Basic Test rewrite or advanced test	Applicants shall have obtained a minimum of 65% on small basic and 80% on small advanced examination of these subjects to meet Transport Canada requirements, but your grade will be represented by the outcome even if you do not meet these thresholds.
July 30	No Class	

Topics and weeks of content delivery are subject to change. Other topics incorporated may include control, detection, and monitoring;

Method of Evaluation

Item	**Format / Topic**	**Contribution**
Assignment	Development of SFOC (groups of 2)	20%
Labs		45%
Test	Radio Operators Test	5%
Test	Small RPAS Basic Test or Equivalent	15%
Test	Small RPAS Advanced Test or Equivalent	10%
Attendance		5%

Labs

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1	5%	Kite and Balloon Flight Regulations
2	10%	Flight Planning

3	10%	Reading Flight Charts
4	15%	Georeferencing RPAS Imagery
5	5%	Best Practices for flight and Geomatics

Late submissions: Assignments 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.

Computer Labs

You can use the ENV lab(s) for practical work in this course when they are not booked for other courses. Flight planning software specific to the course will be installed in the Geddes lab. Access codes are available at the Mapping Analysis and Design helpdesk in EV2.

> *NOTE: No food or drink is allowed in the labs. Failure to abide by this rule may result in your computer accounts being suspended.*

Course Website

A course website has been created on the new learning platform "Learn" (Desire2Learn). Students registered in the course can access the course website after the first day of class by going to the LEARN website (http://learn.uwaterloo.ca) and logging in using your WatIAM/Quest username and password. Once logged in, you will see the course listed under "My Courses and Communities". Click on GEOG or AVIA 270 to see the course content.

The course website provides access to lecture presentations, course notes, and other relevant information. Online material in LEARN can be opened or downloaded by clicking on the appropriate link. In addition, the course website supports announcements, discussion groups and e-mail. Assignments will be handed in via the LEARN course website and students should become familiar with the website and submission process early so as not to receive a late submission.

Getting Help

Students are expected to get into the habit of using the on-line help files as the **first** source of help. The TA and instructor will be available during scheduled help sessions and office hours to answer questions related to the assignments. Additional help is available from the MAD help desk.

Email

Please include the course shortcode and your family name in the subject of your email (e.g. Robinson GEOG/AVIA 374). We will try to respond to emails within 24hrs excluding weekends (i.e. Friday 5pm to Monday 8am). We will respond to emails regarding course content or logistics, while questions or concerns regarding evaluation will be reserved for discussion during office hours. Because the course is co-instructed, it is your responsibility to contact the appropriate instructor for the course materials that you are requesting assistance with.

Email and online discussions are governed by the same rules of academic conduct as your behaviour in class. Please use common courtesy, be polite, and, of course, avoid

sending or forwarding aggressive, sexist, racially discriminatory, obscene, offensive, libellous, or defamatory comments of any kind. If I do not respond to your email within 24 hours please send me another email or see me in person as it may have been deleted by a spam filter or a server may have been down when the email was sent. Email can be a benefit to both the student and instructor objectives; however, email is not a substitute for one-on-one discussion and therefore I prefer to meet with you during office hours.

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.

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 for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department's administrative assistant 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. For typical penalties, check Guidelines for the Assessment of Penalties.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals.

Note for students with disabilities: AccessAbility 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.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check the Office of Academic Integrity for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in

Religious Observances: Please 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.