University of Victoria

Department of Physics & Astronomy
School of Earth & Ocean Sciences
University of Victoria
Spring Term 2026

COURSE OUTLINE

EOS/PHYS 340 A01

Atmospheric Physics

We acknowledge and respect the Lək̓ə̓ŋən (Songhees and Esquimalt) Peoples on whose territory the university stands, and the Lək̓ə̓ŋən and W̱SÁNEĆ Peoples whose historical relationships with the land continue to this day.

Lectures:

Tuesday, Wednesday, Friday 12:30-1:30 (in person)

COURSE DESCRIPTION

An introduction to the study of the atmosphere as a physical system. Equations of motion; force balances; thermodynamics; phase changes of water; radiative transfer; waves and instabilities; predictability.

PREREQUISITES & COREQUISITES

PREREQUISITES: PHYS 102A/102B, or PHYS 110/111, or PHYS 120/130

COREQUISITES: One of EOS 225, 325, MATH 204; One of CHEM 245, PHYS 317

CONTACT INFORMATION

Instructor: Johannes Gemmrich
Email: Gemmrich@uvic.ca
Office: BWC 411
Office Hours: Wednesday 9:30 – 11:00

Teaching Assistant: Robert Payne
Email: gpayne1654@uvic.ca

COURSE MATERIALS

EOS/PHYS 340 lecture notes are available on the Brightspace site

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LEARNING OUTCOMES

Upon completion of this course, students should be able to:

1. Use fundamental dynamical and thermodynamic principles to quantify relationships between atmospheric fields and relate these to weather and climate processes.

2. Identify space and time scales of different atmospheric processes and relate these to their associated physical mechanisms.

3. Apply concepts of predictability in the context of weather forecasts and climate change projections.

4. Use mathematical and computational tools to analyze and interpret atmospheric data and present your results in writing.

5. Produce and interpret graphical representations of atmospheric data.

EVALUATION

Assignments (5)	30%
Midterm Exam (75 minutes)	30%
Final Exam (180 minutes)	40%

Essential Course Requirements: Students must complete both the midterm exam and the final exam to pass the course. Students who do not complete at least these requirements will be assigned an N in the course and a maximum grade of 49%. No supplemental examinations or additional work for extra marks are offered in this course.

Exams: There will be one 75-minute midterm exam, held during the tutorial time slot on Tuesday, February 10, 8:30 am, and a 180-minute final exam which will be scheduled centrally. All examinations are open book. You may bring in any printed or handwritten material. During the examination you may use a calculator so long as it does not communicate with other devices.

COURSE POLICIES

Assignments are due at 4:00 pm on the afternoon of the date indicated in the weekly calendar below. Assignments may be submitted to me in class or in the drop box beside the SEOS main office on the 4th floor of the A wing of the Bob Wright Centre. **Do not slide assignments under my office door**. Late assignments will be accepted with a grade penalty of 20% per day.

Academic Integrity

UVic's Policy on Academic Integrity is found at uvic.ca/calendar/future/undergrad/index.php#/home. It is every student's responsibility to be aware of this policy, including policies on cheating, plagiarism, unauthorized use of an editor, multiple submission, and aiding others to cheat. If you have any questions or doubts, please talk to me. For more information, see uvic.ca/learningandteaching/cac.

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Use of AI

You may use generative AI in this course to help with writing computer code for the assignments. Generative AI tools can be effective tools to assist writing computer code, but you need to understand the code to modify/debug it and ensure that it is in fact carrying out the desired computations. **Be critical!** Other than assisting in code writing the use of any form of generative AI is not authorized nor helpful.

COURSE CALENDAR AND OUTLINE

UVic Important Dates: uvic.ca/calendar/dates/
Last day to add courses: January 21st
Last day to drop a course without penalty of failure: February 28th
Final Exam Period: April 7th to April 22nd

Week	Lecture Dates	Lecture Material (Approximate)
1	Jan 6, 7, 9	Introduction Large-scale structure of Earth's atmosphere Residence times of atmospheric constituents
2	Jan 13, 14, 16	Ideal gas equation of state Saturation vapour pressure Measures of humidity **Assignment 1 due January 16**
3	Jan 20, 21, 23	Condensation and cloud processes Pressure gradient force and hydrostatic equilibrium
4	Jan 27, 28, 30	Pressure gradient force and hydrostatic equilibrium Internal energy and the first law of thermodynamics Specific heat capacities of ideal gases **Assignment 2 due January 30**
5	Feb 3, 4, 6	Entropy and the Clausius-Clapeyron equation Blackbody radiation Radiative transfer
6	Feb 10, 11, 13	Radiative transfer Greenhouse effect & radiative energy budget
	Feb 10, 8:30 am	Midterm examination
7		Reading Break
8	Feb 24, 25, 27	Greenhouse effect & radiative energy budget Adiabatic motion and dry static stability Moist static stability **Assignment 3 due February 24**
9	Mar 3, 4, 6	Convection and convective available potential energy Centrifugal and Coriolis forces Equations of motion

10	Mar 10, 11, 13	Balanced flow: geostrophic wind Balanced flow: gradient wind Drag and unbalanced flow **Assignment 4 due Mar 10**
11	Mar 17, 18, 20	Pressure as a vertical coordinate Thermal wind balance Vorticity and Rossby waves
12	Mar 24, 25, 27	Synoptic-scale variability Planetary-scale circulation Predictability **Assignment 5 due Mar 24**
13	Mar 31, Apr 1	Predictability Review

CHANGES DUE TO UNFORESEEN CIRCUMSTANCES

The above schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances. In the event of significant changes, a revised outline will be posted/circulated.

UVIC GRADING SYSTEM – UNDERGRADUATE

As per the Academic Calendar:

Grade	Grade Point Value	Grade Scale	Description
A+	9	90 – 100%	**Exceptional, outstanding** and **excellent** performance. Normally achieved by a minority of students. These grades indicate a student who is self-initiating, exceeds expectation and has an insightful grasp of the subject matter.
A	8	85 – 89%	
A-	7	80 – 84%	
B+	6	77 – 79%	**Very good, good** and **solid** performance. Normally achieved by the largest number of students. These grades indicate a good grasp of the subject matter or excellent grasp in one area balanced with satisfactory grasp in the other area.
B	5	73 – 76%	
B-	4	70 – 72%	
C+	3	65 – 69%	**Satisfactory**, or **minimally satisfactory**. These grades indicate a satisfactory performance and knowledge of the subject matter.
C	2	60 – 64%	
D	1	50 – 59%	**Marginal** Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.
F	0	0 – 49%	**Unsatisfactory** performance. Wrote final examination and completed course requirements; no supplemental.

Grade	Grade Point Value	Grade Scale	Description
N	0	0 – 49%	Did not write examination or complete course requirements by the end of term or session; no supplemental.

COURSE FEEDBACK

I value your feedback on this course. Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous **Course Evaluation Survey (CES) r**egarding your learning experience. **The survey is important for providing feedback** to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. The survey is accessed online and can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more detailed information nearer the time, but please be thinking about this important activity during the course.

APPENDICES

DEPARTMENT OF PHYSICS AND ASTRONOMY INFORMATION

- **PHAST Website:** uvic.ca/science/physics/index.php
- **PHAST General Office:** physgen@uvic.ca
- **PHAST Undergraduate Advisor:** phast_advising@uvic.ca

SCHOOL OF EARTH AND OCEAN SCIENCES INFORMATION

- SEOS Website: uvic.ca/science/seos
- SEOS Office: seos@uvic.ca
- SEOS Director: Dr. Jay Cullen, seosdirector@uvic.ca
- SEOS Mental Health & Wellness Contact: Dr. Andy Fraass, andyfraass@uvic.ca
- SEOS Undergraduate Advisor: Dr. Jon Husson, seosadvisor@uvic.ca
- SEOS Graduate Advisor: Dr. Roberta Hamme, seosgradadvisor@uvic.ca
- Ocean Science Mentor: Dr. Jody Klymak, seosoceansci@uvic.ca
- Climate Science Advisor: Dr. Colin Goldblatt, climateadvising@uvic.ca

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UNIVERSITY STATEMENTS & POLICIES

- Academic Calendar: Information for All Students
- Creating a respectful, inclusive, and productive learning environment
- Accommodation of Religious Observance
- Accommodation and Access for Students with Disabilities
- Student Conduct
- Non-academic Student Misconduct
- Accessibility
- Diversity / EDI
- Equity Statement
- Sexualized Violence Prevention and Response
- Discrimination and Harassment Policy

STUDENT RESOURCES

POSITIVITY AND SAFETY

The University of Victoria is committed to promoting, providing, and protecting a positive and safe learning and working environment for all its members.

Student Groups & Resources

ACADEMIC RESOURCES

UVic Library - *UVic Library offers many services and resources for undergraduate and graduate students*.

uvic.ca/students/academics/library-services

Learning Resources - *UVic Learn Anywhere is the primary learning resource for students that offers many learning workshops and resources to help students with academics and learning strategies.*

onlineacademiccommunity.uvic.ca/uviclearn/

Centre for Academic Communication - *Offers online and in-person one-on-one tutorials, workshops, and more.*

uvic.ca/learningandteaching/cac

Physics Aid Service – *Addresses problems with conceptual understanding, difficulties encountered with homework assignments, preparation for mid-term and final exams, and occasionally even preparation for external exams such as the MCAT. Instruction may be one-to-one or in small groups, with emphasis placed on engaged interaction between the students and the instructor.*

https://www.uvic.ca/science/physics/current/undergraduate/pas/index.php

MENTAL HEALTH & WELLNESS

A note to remind you to take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep, and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone.

Student Wellness Centre - *Our team of practitioners offers a variety of services to support students' mental, physical, and spiritual health.*

uvic.ca/student-wellness

Counselling Services - *Counselling Services can help you make the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students.*

uvic.ca/student-wellness

Health Services - *University Health Services (UHS) provides a full-service primary health clinic for students and coordinates healthy student and campus initiatives.*

uvic.ca/student-wellness

ACCESSIBILITY

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a documented disability or health consideration that may require accommodations, please feel free to approach me and/or the Centre for Accessible Learning (CAL) as soon as possible.

Centre for Accessible Learning - *The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.*

uvic.ca/accessible-learning

ADVISING

For academic advising-related questions, students are also encouraged to meet with the Undergraduate Advisor (Department of Physics & Astronomy: phast_advising@uvic.ca; School of Earth & Ocean Sciences : seosadvisor@uvic.ca) as well as an academic advisor in the Academic Advising Centre early in their studies to help map out a plan to declare a major and complete university program requirements.

Academic Advising Centre - *Academic advice and support is currently available by phone, email and virtual or in-person appointments*. uvic.ca/services/advising

Ombudsperson - *The ombuds office is an independent, impartial, and confidential resource for undergraduate and graduate students and other members of the University of Victoria community. The ombudsperson helps resolve student problems or disputes fairly.* uvicombudsperson.ca

ACADEMIC CONCESSION

You can request an academic concession if your course requirements are affected by unexpected and unavoidable circumstances, or conflicting responsibilities. Concession requests can be for an in-course extension, deferral, withdrawal under extenuating circumstances, or an aegrotat. Please speak to an advisor at the Academic Advising Centre if you have questions on how requesting a concession will affect your academic program.

Undergraduate Academic Concessions - uvic.ca/students/academics/academic-concessions-accommodations

EQUITY AND HUMAN RIGHTS AT UVIC

EQHR is a resource for students, staff, and faculty who have experienced sexualized violence, discrimination, and/or harassment and are looking for informal and/or formal resolution options as well

as advice, coaching, and/or education. We are available for confidential consultations so that you can ask questions and learn your options.

EQHR – By email at eqhr01@uvic.ca or in-person (Sedgewick C115). uvic.ca/equity

Sexualized Violence Resource Office – *If you have been directly or indirectly impacted by sexualized violence, reach out to the SVRO for information, advice, and resolution options (restorative and disciplinary) as well as support options and referrals. The SVRO is both survivor-centred and trauma-informed in their approach. You can reach us by phone at 250-721-8021 or by email at eqhr01@uvic.ca to book either an in-person (Sedgewick C119) or online appointment.* uvic.ca/sexualizedviolence

RESOURCES FOR INTERNATIONAL STUDENTS

International Centre for Students - *The primary office supporting international students on campus at the university-wide level*. uvic.ca/international-experiences

UVic Global Community Initiative - *Provides various supportive programming, including a Mentorship Program and Conversation Partner Program*. uvic.ca/international-experiences/get-involved/uvic-global-community

RESOURCES FOR INDIGENOUS STUDENTS

Indigenous Student Support - *UVic offers holistic services to Indigenous students throughout their academic journey.* uvic.ca/students/info-for/indigenous-students

Elders in Residence - *The Office of Indigenous Academic and Community Engagement (IACE) has the privilege of assembling a group of Elders from local communities to guide students, staff, faculty, and administration in Indigenous ways of knowing and being.* uvic.ca/iace/