Term Information

Effective Term	Spring 2026

General Information

Course Bulletin Listing/Subject Area	Atmospheric Sciences
Fiscal Unit/Academic Org	Geography - D0733
College/Academic Group	Arts and Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5502
Course Title	Physical Meteorology
Transcript Abbreviation	Phys. Meteorology
Course Description	Introduce students to the fundamental principles underlying radiation physics, cloud physics and atmospheric chemistry. Student will understand underlying phase changes, radiation processes, and chemical reaction rates and how they influence weather.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	This class is a calculus-based course that builds off the knowledge obtained in an atmospheric thermodynamics course. As such, the prerequisites are (1) ATMOSSCI 5950 (Atmospheric Thermodynamics) or equivalent, and (2) MATH 2153 (Calculus III) or equivalent.
Exclusions	None
Electronically Enforced	Yes

Cross-Listings

Cross-Listings	None

Subject/CIP Code

Subject/CIP Code	40.0401
Subsidy Level	Doctoral Course
Intended Rank	Junior, Senior, Masters, Doctoral

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Remember and understand fundamental concepts essential for explaining physical processes in the atmosphere. Concepts include (i) molecular/atomic energies, (ii) photons, (iii) free energies, (iv) reaction kinetics, and (v) stochastic collection.
- Apply principles to explain (i) atmospheric optical phenomena (e.g., colors of the sky), (ii) the formation of atmospheric aerosols and pollutants, (iii) the format and growth of liquid water and and ice in clouds, and (iv) drop size distributions.
- Analyze and evaluate (i.e., critique) computer weather models and observationally retrieved data products.

Content Topic List

- Molecular Energies
- The Lifecycle of Photons in the Atmosphere
- Remote Sensing
- Free Energies
- Chemical & Phase Equilibria
- Reaction Kinetics
- Aerosols and Air Pollutants
- Nucleation and Growth of Hydrometeors from Vapor
- Growth of Hydrometeors from Collection
- Microphysics Parameterization
- Cloud Electrification

Sought Concurrence

Yes

Attachments

- AS5502_PhysMet_Syllabus.pdf: ATMOSSC 5502_Syllabus

  (Syllabus. Owner: Godfrey,Ryan B)
- Concurrence Request Documentation_AS5502.pdf: ATMOSSC 5502_Concurrence

  (Concurrence. Owner: Godfrey,Ryan B)
- Curriculum Map_ATMOSSC BS_ATMOSSC 5502.pdf: ATMOSSC 5502_Curriculum Map

  (Other Supporting Documentation. Owner: Godfrey,Ryan B)

Comments

- Note this course is a new course developed from one-time offering in advance of a new version of the ATMOSSC BS major. While an elective now for students, it will become a required course in the major when proposal submitted and approved by the college. Masters level course only if student needs for prerequisite into the program. *(by Godfrey,Ryan B on 02/24/2025 12:48 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Godfrey,Ryan B	02/24/2025 12:49 PM	Submitted for Approval
Approved	Coleman,Mathew Charles	02/24/2025 05:00 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	03/04/2025 12:13 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	03/04/2025 12:13 PM	ASCCAO Approval

THE OHIO STATE UNIVERSITY

College of Arts and Sciences
Department of Geography

SYLLABUS

ATMOSSC 5502

Group Studies: Physical Meteorology
Spring 2026 – Course # XXX

COURSE OVERVIEW

Course information

- **Class periods:** Tuesday, Thursday, 12:45pm – 2:05pm (80 minutes)
- **Credit hours:** 3
- **Prerequisites:** ATMOSSCI 5950 (or equivalent) and MATH 2153 (or equivalent)
- **Classroom:** DB 70
- **Mode of delivery:** In Person
- **Textbooks (available for free for Ohio State students):**
  (1) MIT OpenCourseWare Notes "Atmospheric Radiation"
  https://ocw.mit.edu/courses/12-815-atmospheric-radiation-fall-2008/
  (2) "Atmospheric Thermodynamics" by Craig Bohren and Bruce Albrecht*
  (3) "Physics and Chemistry of Clouds" by Dennis Lamb and Johannes Verlinde*
  **Available as E-Books through the Ohio State University Libraries' Catalog*

Instructors

Instructor: Dr. Man-Yau (Joseph) Chan (address as Dr Chan or Dr C)

- Email address: chan.1063@osu.edu – this is the best way to reach me.
- Office hours: Thursdays XX:YY to XX:YY (2 hours).

- Office hour location: DB 1132

Graduate Teaching Assistant (GTA): TBD

- Email: TBD.X@buckeyemail.osu.edu
- Office hours: by appointment

Course description

Radiation physics, cloud physics, and atmospheric chemistry are important for modern meteorology, especially for making weather predictions. Even now, computer weather models can only handle these processes approximately (via parameterization schemes). As such, it is important to understand and appreciate these fundamental processes, and to know where our understanding and models are deficient.

ATMOSSCI 5502 introduces students to the fundamental principles underlying radiation physics, cloud physics and physical chemistry (a part of atmospheric chemistry). This includes the principles underlying phase changes (e.g., condensation of cloud droplets), radiation processes (e.g., energy quantization), and chemical reaction rates. By the end of the semester, students will not only be conversant with these principles, but also how they influence weather.

This class is a calculus-based course that builds off the knowledge obtained in an atmospheric thermodynamics course. As such, the prerequisites are (1) ATMOSSCI 5950 (Atmospheric Thermodynamics) or equivalent, and (2) MATH 2153 (Calculus III) or equivalent.

To reinforce learning outcomes, this course has (a) homeworks (due once every 1~2 weeks), (b) 2 mid-term tests and (c) a Final Exam. All tests/exams in this course are take-home and untimed (students just need to submit the exam by 11.59pm of the day it is assigned) and ***students can use their notes, textbooks, and the internet during the examination.*** Students are forbidden from communicating with anyone (except the instructor) about the tests/exam until after the tests/exam completion deadline.

Course-based Goals

By the end of the semester, students will:

1. **Remember** and **understand** fundamental concepts essential for explaining physical processes in the atmosphere. These concepts include (i) molecular/atomic energies, (ii) photons, (iii) free energies, (iv) reaction kinetics, and (v) stochastic collection.
2. **Apply** those fundamental principles to explain processes and phenomena relevant to physical meteorology. These processes and phenomena include (i) atmospheric optical phenomena (e.g., colors of the sky), (ii) the formation of atmospheric aerosols and pollutants, (iii) the formation and growth of liquid water and ice in clouds, and (iv) drop size distributions.
3. **Analyze** and **evaluate** (i.e., critique) computer weather models and observationally retrieved data products.

HOW THIS COURSE WORKS

Mode of delivery: In-person, lecture-based.

Course materials: All course materials will be accessible from OSU's **Carmen Canvas** interface. These materials include:

1. Lecture notes (PDF format; released before class and updated after class),
2. Worksheets for assignments (PDF format), and,
3. Video recordings of lectures (MP4 format).

Weekly activities and materials: This course has twice-a-week in-person classes. ***Assignments are due every 1~2 weeks on Mondays by 11:59 p.m.*** A weekly class schedule will be provided outlining content and assignments. ***The schedule is subject to change so students should be sure to retain the most current version.*** All scheduling changes will be articulated clearly to class via Carmen Announcements.

Credit hours and work expectations: This is a **3-credit-hour course**. According to Ohio State policy, students should expect around 3 hours/week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to **6 hours/week of homework** (assignments) to receive a passing grade.

Expectations of Students (Outside of Assignments and the Exam)

- **Attendance:** Students are expected to attend all classes and attendance will be tracked by use of **in-class participation quizzes**. These quizzes contribute to the Participation category in calculating the final grade (see table under "Grading and Faculty Response"). ***Students are not penalized for making mistakes on these participation quizzes.***

COURSE MATERIALS AND TECHNOLOGIES

Textbooks

There are three required textbooks for this course. Electronic versions of these textbooks are freely available to Ohio State University students at no cost.

1. MIT OpenCourseWare Notes "Atmospheric Radiation" https://ocw.mit.edu/courses/12-815-atmospheric-radiation-fall-2008/
2. "Atmospheric Thermodynamics" by Craig Bohren and Bruce Albrecht*
3. "Physics and Chemistry of Clouds" by Dennis Lamb and Johannes Verlinde*

**Available as E-Books through the Ohio State University Libraries' Catalog*

Technologies

REQUIRED EQUIPMENT

- **Computer/Mobile Device (smartphone or tablet):** used to view course materials (lectures, assignment questions, etc) and submit assignments/tests/exams.
- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone
- **Other:** a mobile device (smartphone or tablet) or landline to use for BuckeyePass authentication

REQUIRED SOFTWARE

- **A web browser (e.g., Google Chrome, Apple's Safari):** This is needed to view course materials (PDFs), watch recorded lectures, and access CarmenCanvas.

- **Zoom** (https://osu.zoom.us/) is the academic audio web conferencing solution for Ohio State and we will be using it for possible office hour options.
    - Getting started with CarmenZoom
- **TopHat:** We will use TopHat to deliver quizzes during lecture for synchronous student response.

Carmen: Accessibility, Help, Skills & Multi-Factor Authentication

ACCESSIBILITY OF CARMEN

This course requires use of Carmen (Ohio State's learning management system) and a web browser. If you need additional services to use these technologies, please request accommodations with your instructor.

- CarmenCanvas accessibility
- CarmenZoom accessibility

HELP WITH CARMEN (OR OTHER IT ISSUES)

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** ocio.osu.edu/help
- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu
- **TDD:** 614-688-8743

Basic computer and web-browsing skills are expected, and navigating Carmen is an essential skill for this course. For questions about specific functionality, see the Canvas Student Guide.

REQUIRED TECHNOLOGY SKILLS SPECIFIC TO THIS COURSE

- CarmenZoom virtual meetings (e.g., for snow days)
- Uploading assignments on CarmenCanvas
- Using web browsers

CARMEN MULTI-FACTOR AUTHENTICATION

You will need to use BuckeyePass multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

GRADING AND FACULTY RESPONSE

How your grade is calculated (% breakdown)

ASSIGNMENT CATEGORY	% POINTS
Participation (ungraded quizzes)	10
Homeworks	45
Midterm Test 1 (End of Week 5)	10
Midterm Test 2 (End of Week 11)	15
Final Exam	20
Total	**100**

Assignment descriptions:

Participation: This will be assessed based on completing participation quizzes. ***The participation quizzes will occur during class time.***

Homeworks: There will be 11 homeworks in this course (due every 1~2 weeks). These homework assignments are problem sets that should take students up to 4 hours/week to complete. Students will submit their worked answers to those problem sets on CarmenCanvas and are permitted to use all resources available to them, including the internet and AI tools. ***All usage of AI tools and external materials (e.g., Wikipedia) must be declared in the submission.*** While students are encouraged to work together on homework assignments, every student must submit his/her/their own work. Students are strongly encouraged to make use of the instructor's office hours.

Mid-term Tests and Final Exam: To reinforce learning outcomes and to assess the students' mastery of the material, this course has two take-home mid-term tests and a take-home Final Exam. Students will be given up to 24 hours to complete each test/exam and are permitted to consult their past work, notes, textbooks, the Internet, and AI tools. However, ***students are forbidden to communicate with anyone (except the instructor) about the test/exam until after the deadline***. All usage of ***AI tools and external materials must be declared in the test/exam***. The content tested is cumulative. Students will submit their worked answers to the test/exam questions on CarmenCanvas.

Late assignments

Please refer to Carmen for due dates. Late assignments will be penalized by 10% per day late, and only accepted up to a maximum of 4 days late. If students anticipate having conflicts, they are expected to discuss with instructors ahead of time.

Grading scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70 –72.9: C-
67 –69.9: D+
60 –66.9: D
Below 60: E

Instructor feedback and response time

Grading and feedback: Students can generally expect feedback within 14 days.

Email: Emails are the fastest way to contact the instructor. The instructor will generally reply to emails within **48 hours on days when class is in session at the university**. To help the instructor identify emails relating to the course, students should start their email's subject with "Phys Met".

COURSE SCHEDULE

ATMOSSC 5502 WEEKLY SCHEDULE*

Class Lecture Topics, Homework Assignments, Mid-term Tests and Final Exam*

*Note: These topics and homework assignments are *subject to change*! Students will be advised of updates to the schedule on Carmen and should follow the version with the most current date.

Classes 2x/week (80 mins).

HA stands for Homework Assignment. Dates are in day (month/day) format [e.g., T (8/20) means Tuesday Aug 20th, R (8/22) means Thursday Aug 22nd].

Wk	Date	Class Topic(s)	Assignment
1	T (1/7)	Review of Past Courses	Homework 1 assigned (due on Monday 1/13)
	R (1/9)	Review of Past Courses	
2	T (1/14)	Molecular Energies	Homework 2 assigned (due on Monday 1/20)
	R (1/16)	Molecular Energies	
3	T (1/21)	The Lifecycle of Photons in the Atmosphere	Homework 3 assigned (due on Monday 1/27)
	R (1/23)	The Lifecycle of Photons in the Atmosphere	

4	T (1/28)	The Lifecycle of Photons in the Atmosphere	Homework 4 assigned (due on Monday 2/3)
	R (1/30)	The Lifecycle of Photons in the Atmosphere	
5	T (2/4)	Remote Sensing	
	R (2/6)	Pre-Midterm Review	**Midterm Test 1 on Monday 2/10**
6	T (2/11)	Free Energies	Homework 5 assigned (due on Monday 2/17)
	R (2/13)	Free Energies	
7	T (2/18)	Chemical & Phase Equilibria	Homework 6 assigned (due on Monday 2/24)
	R (2/20)	Chemical & Phase Equilibria	
8	T (2/25)	Reaction Kinetics	Homework 7 assigned (due on Monday 3/10)
	R (2/27)	Reaction Kinetics	
9	T (3/4)	**Spring Break**	
	R (3/6)	**Spring Break**	
10	T (3/11)	Aerosols and Air Pollutants	
	R (3/13)	Pre-Midterm Review	**Midterm Test 2 on Monday 3/17**
11	T (3/18)	Nucleation and Growth of Hydrometeors from Vapor	Homework 8 assigned (due on Monday 3/24)
	R (3/20)	Nucleation and Growth of Hydrometeors from Vapor	
12	T (3/25)	Growth of Hydrometeors from Collection	Homework 9 assigned (due on Monday 3/24)
	R (3/27)	Growth of Hydrometeors from Collection	
13	T (4/1)	Microphysics Parameterization	Homework 10 assigned (due on Monday 4/7)
	R (4/3)	Microphysics Parameterization	

14	T (4/8)	Cloud Electrification	Homework 11 assigned (due on Monday 4/14)
	R (4/10)	Cloud Electrification	
15	T (4/15)	Review for Final Exam	
	R (4/17)	Review for Final Exam	

OTHER COURSE POLICIES

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: Students should use proper grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics in class discussion forums.
- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. ***Remember that sarcasm doesn't always come across online.***

Academic integrity policy

- **Participation quizzes**: Students must complete the participation quizzes **by themselves**. These quizzes are “open book” – students can refer to notes, course materials, and Carmen during the quizzes.
- **Mid-term Tests and Final Exam:** During the Mid-term Tests and Final Exam, students are permitted to consult their past work, notes, textbooks, the Internet, and AI tools. However, students are forbidden to communicate with anyone (except the instructor) about the test/exam until after the deadline. All usage of AI tools and external materials must be declared in the student’s submission.
- **Homeworks**: Working with other students is permitted, but *every student must submit their own work.* The use of AI tools and external material is permitted as long as those uses are declared in the homework submission.

- **Reusing past work**: In general, students are prohibited in university courses from turning in work from a past class, even if modified. Students should discuss the situation with instructors in advance if there is any doubt.

Ohio State's academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7 (B)). For additional information, see the Code of Student Conduct.

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on diversity

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Statement on Title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support

applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614--292--5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614--292--5766 and **24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.**

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS

Requesting accommodations for disabilities

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Requesting religious accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity. (Policy: Religious Holidays, Holy Days and Observances)

Concurrence Request:

Sought for the New Atmos Sci 5502 – Physical Meteorology

Sent to: The School of Earth Sciences, on 12/11/2024

Response requested by: 1/3/2025

From: Houser, Jana
Sent: Wednesday, December 11, 2024 3:33 PM
To: Cook, Ann <cook.1129@osu.edu>
Cc: Godfrey, Ryan <godfrey.117@osu.edu>; Coleman, Mat <coleman.373@osu.edu>; Chan, Joseph <chan.1063@osu.edu>
Subject: Concurrence Request #2

Hi Ann,

I have one more course concurrence request for SES. We are also proposing a new course in physical meteorology. Could you also give the syllabus attached here a look and see if you have any concerns over concurrence?

Again, a 1/3 deadline is requested, but if you can get to it sooner that would be great!

Thanks!

-Jana

Dr. Jana Houser
Director of Undergraduate Studies
Associate Professor of Meteorology
Atmospheric Sciences Program
Department of Geography

NO RESPONSE BY 1/4/2025.

Curriculum map, indicating how program goals are accomplished via specific courses
Atmospheric Sciences (Bachelor of Science)

KEY:	*1=Beginner*	*2= Intermediate*	*3 = Advanced*	

	Learning Outcome A	Learning Outcome B	Learning Outcome C	Learning Outcome D
Prerequisites or Corequisites:				
MATH 1151				1
MATH 1152				1
MATH 2153				1
MATH 2255				2
PHYSICS 1250	1	1		
PHYSICS 1251	1	1		
CHEM 1210	1	1		
STATS 2450				1
GEOG 3597.03 (EL)				
Required Core:				
ATMOSSC 2940 OR GEOG 5900	1	1	1,2	1
GEOG 5921	1	2	2	2
GEOG 5922	3		2	
ATMOSSC / GEOG 5940		3	3	3
GEOG 5941	3	2	3	2
GEOG 5942	3	2	3	3
ATMOSSC 5950	2	2	2	2
ATMOSSC 5951	3	2	2	2
ATMOSSC 5952	3	2	2	3
Electives:				
GEOG 1950	**1**	**1**	**1**	**1**
ATMOSSC 5502		2,3	2	3
ATMOSSC 5401	3		2	3
ATMOSSC 5701	2,3	2,3	3	2,3
ATMOSSC 5901	2	3	2	
GEOG 3900.01 OR GEOG 3900.02 OR GEOG 3901H	2		3	
GEOG 3597.02	1	2	1	
GEOG 5200	1	1	2	1
GEOG 5210	1	1		
GEOG 5225	2	2		2
EARTHSC 2206	1		1	
CIVILEN 5130	3	3		3
CIVILEN 5420	2	3		2

Learning Outcome A: Students acquire the theoretical basis for fundamental atmospheric processes and systems.
Learning Outcome B: Students are familiar with computational and other forms of technology used in the atmospheric sciences.
Learning Outcome C: Students can communicate atmospheric science concepts and methods orally, visually, and in writing.
Learning Outcome D: Students can solve problems faced by atmospheric scientists.