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	5401
Course Title	Practical Data Processing and Analysis for Atmospheric Sciences
Transcript Abbreviation	Atmospheric Data
Course Description	Hands-on, skills-centric course on data processing and analysis for Atmospheric Science. Students will successfully distill large volumes of raw atmospheric science data, extract meaningful relationships from the distillate, diagnose what information is needed to solve problems, and communicate their processing and analysis techniques to other atmospheric scientists.
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	Prerequisite: Completion of ATMOSSC 2940 or GEOG 5900
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, understand and apply basic methods to distill raw atmospheric science data and analyze the distillate.
- Independently learn new processing and analysis techniques.
- Analyze problem statements to determine what information needs to be stilled from raw atmospheric science data.
- Create complex data processing and analysis procedures from basic data analysis and processing methods.
- Evaluate the weakness of data processing and analysis procedures.
- Communicate their data processing and analysis procedures to other atmospheric scientists in written form.

Content Topic List

- Atmospheric Sciences and Meteorology
- Data Analysis
- Statistical Methods
- Uncertainty Quantification
- Numerical Methods
- Programming / Python for Atmospheric Sciences

Sought Concurrence

Yes

Attachments

- AS5401_Data_Processing_and_Analysis_Syllabus.pdf: ATMOSSC 5401_Syllabus

  (Syllabus. Owner: Godfrey,Ryan B)
- Concurrence Request Documentation_AS5401.pdf: ATMOSSC 5401_Concurrence

  (Concurrence. Owner: Godfrey,Ryan B)
- Curriculum Map_ATMOSSC BS_ATMOSSC 5401_ Jan2025.pdf: ATMOSSC 5401_Curricular 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 01:03 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Godfrey,Ryan B	02/24/2025 01:04 PM	Submitted for Approval
Approved	Coleman,Mathew Charles	02/24/2025 04:59 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	03/04/2025 12:09 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 12:09 PM	ASCCAO Approval

THE OHIO STATE UNIVERSITY

College of Arts and Sciences
Department of Geography

SYLLABUS

ATMOSSC 5401

Practical Data Processing and Analysis for Atmospheric Science

Fall 2025 – Course # XXX

COURSE OVERVIEW

Course information

- Class periods: Tuesday, Thursday, 11:10am-12:30pm (80 minutes)
- Credit hours: 3
- Prerequisites: ATMOSSC 2940 or GEOG 5900
- Classroom: Derby Hall 135
- Mode of delivery: In Person, short lectures with plenty of in-class exercises
- Required Textbook: None.
- Recommended Textbook: “Statistical Methods in the Atmospheric Sciences” by Daniel S. Wilks (PDF version available in the Ohio State University library)

Instructors

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

- Email address: chan.1063@osu.edu
- Office hours: Fridays from 10.40am to 12.40pm
- Office hour location: Derby Hall 140

Course description

Data processing and analysis skills are crucial for all careers in atmospheric science and meteorology. Without these skills, forecasters and scientists cannot navigate and analyze the

terabytes of data that are needed to understand and/or predict atmospheric behavior.

ATMOSSC 5401 is a ***hands-on, skills-centric*** course on data processing and analysis for atmospheric science. By the end of the semester, students will successfully distill large volumes of raw atmospheric science data, extract meaningful relationships from the distillate, diagnose what information is needed to solve problems, and communicate their processing and analysis techniques to other atmospheric scientists.

There are no prerequisites for the class. We will use basic arithmetic, simple statistics, and a little algebra.

This class has a final group project, homework assignments (due weekly), and graded in-class exercises. There is no final examination.

Course-based Goals

By the end of the semester, students will successfully:

1. Remember, understand and apply basic methods to distill raw atmospheric science data and analyze the distillate,
2. Independently learn new processing and analysis techniques,
3. Analyze problem statements to determine what information needs to be distilled from raw atmospheric science data,
4. Create complex data processing and analysis procedures from basic data analysis and processing methods,
5. Evaluate the weaknesses of data processing and analysis procedures presented to them,
6. Communicate their data processing and analysis procedures to other atmospheric science in written form.

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 materials (PDF and PPT formats; released before class)
2. Worksheets for assignments, hands-on exercises (PDF format)
3. Video recordings of lectures and demonstrations (MP4 format)

Weekly activities and materials: This course has twice-a-week classes comprising of interwoven lectures and in-class exercises. ***Assignments are due every week on Thursdays by 11:59 p.m. The final project will have a longer due date (~4 weeks). No assignments will be due within 2 weeks of the final project's due date***. 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 per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (assignments and the final project) to receive a passing grade.

Expectations of Students (Outside of Assignments and the Final Project)

- **Exercises:** Students are expected to attend all classes and attendance will be tracked by use of **in-class exercises**. These exercises contribute to the In-Class Exercises category in calculating the final grade (see table under "Grading and Faculty Response").

COURSE MATERIALS AND TECHNOLOGIES

Textbooks

There is no required textbook for this course. Course materials will be provided on Carmen (see previous page).
An optional, but recommended, textbook for this course is "Statistical Methods in the Atmospheric Sciences" by Daniel S. Wilks.

Technologies (VERY IMPORTANT)

REQUIRED EQUIPMENT

- **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
- **Laptop:** Windows OS, Mac or Linux OS. At least 8 GB of Random Access Memory (RAM), at least 10 GB of available storage space, and at least 4 cores in the Central Processing Unit (CPU).

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
- **Visual Studio Code (VSCode)**: VSCode is the main tool we will be using to perform data processing and analysis. However, if you want to work on your laptop for this class, you need to install VSCode on your laptop (click here for instructions).

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
In-Class Exercises	20
Homework Assignments	45
Final Project	35
Total	**100**

Assignment descriptions:

In-Class Exercises: A set of in-class exercises will be released on Carmen every class. These exercises will reinforce the course material covered during the class. Students will submit their answers on Carmen by 11.59pm on the same day. ***In-class exercises are not graded – simply attempting them in-class and turning them is sufficient.*** Collaboration between students is permitted, but ***every student must turn in their own work***. Artificial intelligence (AI) tools can be used without penalty as long as the student acknowledges and documents their usage in their submitted work. **Please contact the instructor if you are missing class with a valid reason.**

Homework Assignments: Every week, a homework assignment will be due. Students will turn in their answers on Carmen. Students should expect to spend 3-6 hours on each assignment. ***In-class time can be used to complete assignments if the student has completed the in-class exercises assigned to that particular class period.*** Collaboration between students is permitted, but ***every student must turn in their own work***. Artificial intelligence (AI) tools can be used without penalty as long as the student acknowledges and documents their usage of such tools in their submitted work.

Final project: In the last month of the semester, a final project will be released. This project will take approximately 33 hours to complete (including 9 hours of in-class time dedicated to the final project). Students should expect to take around 24 hours of out-of-class time to

complete this project. **The final project is a group assignment**. AI tools can be used without penalty as long as the student acknowledges and documents their usage such tools in their submitted work.

Late assignments

Please refer to Carmen for due dates. Late homework 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 business days when class is in session at the university**.

COURSE SCHEDULE

ATMOSSC 5401 WEEKLY SCHEDULE*
Class Lecture Topics, Exercises*, and Homework Assignments*
*Note: These topics, exercises, 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. T stands for Tuesday, R stands for Thursday.

Wk	Date	Class Topic(s) [30-min lecture + 50-min in-person exercise(s)]	Assignment
1	T	Introductions, install VSCode, basic VSCode usage	Complete the first pulse-taking survey (must be done by the end of week 1)
	R	Bash scripting and Arithmetic	
2	T	Easiest Atmospheric Science data: Scalars	
	R	Reusable Procedures	**HA1 released – due Wk 3 R**
3	T	Navigating Atmospheric Profiles and Time Series	
	R	Visualizing Profiles and Time Series	**HA2 released – due Wk 4 R**
4	T	Simulating, Propagating, and Visualizing Atmospheric Data Uncertainties	
	R	Parsing Raw Atmospheric Data from a Single Observation	**HA3 released – due Wk 5 R**
5	T	Decoding Consolidated Raw Atmospheric Observation Data Files	
	R	Decoding Gridded Probabilistic Spatiotemporal Atmospheric Data Files	**HA4 released – due Wk 6 R**

6	T	Navigating and Visualizing Probabilistic Spatiotemporal Atmospheric Data	
	R	Summarizing Probabilistic Spatiotemporal Atmospheric Data	**HA5 released – due Wk 7 R**
7	T	Storing Gridded Atmospheric Data	
	R	Obtaining Gridded Atmospheric Model Data from Online Sources	**HA6 released – due Wk 8 R**
8	T	Accessing Atmospheric Observation Data from Online Sources	
	R	**Autumn Break**	
9	T	Review	
	R	Approximate Rates of Change	**HA7 released – due on Wk 10 R**
10	T	Atmospheric Budget Equations	
	R	Simulating In-Situ Atmospheric Observations from Forecast Data	**HA8 released – due on Wk 11 R**
11	T	Decomposing Atmospheric Data into Spatiotemporal Components	
	R	Forecast Validation	**HA9 released – due on Wk 12 R**
12	T	Visualizing and analyzing phase space	**Final project released** **Due on last day of class at 11.59pm**

	R	Isolating Dominant Features through Principal Component Analysis	
13	T	Isolating Relationships through Least Squares Regression	
	R	Hypothesis Testing and Field Significance	
14	T	In-class time to work on final project	
	R	In-class time to work on final project	
15	T	In-class time to work on final project	
	R	**Thanksgiving**	
16	T	In-class time to work on final project	

Final project due on the last day of class at 11.59pm

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

- **Homework Assignments**: Working with other students is permitted, but ***every student must submit their own work.*** The use of AI tools is permitted as long as the student indicates that they have used them in their 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.
- **Final project**: This course includes a final group project. AI tools can be used as long as the students indicates that they have used such tools in their submission.

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.

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)

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.**

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.

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.

Concurrence Request:

Sought for the New Atmos Sci 5401 – Practical Data Processing

Sent to: The School of Earth Sciences, The Department of Computer Sciences and Engineering, and the Department of Statistics on 12/11/2024

Response requested by: 1/3/2025

To: Lee, Yoonkyung; Zhang, Yuan; Williamson, Donald; Cook, Ann Wed 12/11/2024 3:23 PM
Cc: Coleman, Mat; Godfrey, Ryan; Chan, Joseph

You forwarded this message on Wed 12/11/2024 3:37 PM

AS5401_Data_Processing_and_... 779 KB

Dear Chairs and Directors of Undergraduate Studies,

The Department of Geography is requesting your concurrence for a new course offering in atmospheric science data processing and analysis. The course is designed for atmospheric science majors to cover required knowledge topics specified by the American Meteorological Society and the World Meteorological Organization that OSU's program is currently weak in.

We invite you to review the syllabus attached. We note that this request is coming on the front of the winter break and holidays. We request a response to concurrence by 1/3/2025, however, if at all possible to receive an answer prior to the close of the fall semester, that would be greatly appreciated.

Thank you for your consideration.

-Jana

Response from CSE:

Williamson, Donald

To: Houser, Jana

Thu 12/19/2024 8:24 AM

You forwarded this message on Thu 12/19/2024 10:50 AM

Start reply with: Thank you! | Thank you for your confirmation. | Great, thank you so much!

Dear Jana,

CSE doesn't have any issues with this course, so we approve the concurrence request.

Best,

Donald S. Williamson
Associate Professor
Director, The ASPIRE Group
Affiliated faculty, Translational Data Analytics Institute
Computer Science and Engineering
493 Dreese Labs, 2015 Neil Ave, Columbus, OH 43210
williamson.413@osu.edu

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Response from SES:

Sawyer, Derek

To: Houser, Jana

Thu 12/19/2024 10:26 AM

You forwarded this message on Thu 12/19/2024 10:50 AM

Start reply with: Great, thanks for letting me know! | Wonderful, thank you! | Thanks for the feedback!

Dear Jana,

The Earth Sciences curriculum committee has reviewed the course proposal for ATMOSSC 5401" Practical Data Processing and Analysis for Atmospheric Science."

We find no significant overlap with courses we offer.

Looks like a great course!

Best regards,
Derek

NO RESPONSE FROM STATS 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.