

SCI 222: Introduction to Meteorology
Spring 2023
Maine School of Science and Mathematics

Instructor

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Office Hours: Sun 6:30–7:30 PM; MTR 11:30–12:25; W 9:30–10:25

Class Meetings

Room B216. *Class*: 1:15–2:10 PM; *Lab*: Wednesday 1:15–3:10 PM.

Objectives

After completion of this course, the successful student will be able to:

- Explain the forces and interactions that determine the weather and climate.
- Describe and explain weather events.

Course Content and Approach

The atmosphere is a minor component of the Earth by mass, but its fluid nature renders it the most effective agent transporting material and energy at the surface. This course explores how energy and matter move in the atmosphere to produce daily weather, regional climates, and large-scale events. Students will demonstrate mastery of the subject matter by individual projects of their choosing.

Resources

Textbook

Weather: A Concise Introduction, Second Edition, by Gregory J. Hakim and Jérôme Patoux, Cambridge University Press, 2021.

Canvas

Homework assignments are administered on Canvas.

Infinite Campus

Grade records are maintained on Infinite Campus.

Grading

Projects	50%
Lab	25%
Homework	15%
Class work	10%

Class

Attendance is expected in class. Class work receives full credit if it shows evidence of earnest effort in good faith.

Projects

For each thematic section of the course, you will create a project to demonstrate your understanding of the content. Projects are the most significant input (50%) determining your course grade. They will be submitted in pieces, so that I can assist and verify your progress.

Thematic Sections

The thematic sections of the course with the point values of their projects are listed below.

Section	Chapters	Points
I. Weather Data	1–2	50
II. Matter and Energy	3–5	125
III. Weather Components	6–9	125
IV. Weather Events	10–13	125
V. Human Impact	14–15	75

Homework

Homework problems are assigned to reinforce the covered material. For full credit, you must explain how to approach and answer the question. Merely giving an answer, even if it is correct, will not earn full credit.

Laboratories

Weekly laboratory participation is an essential component of the course.

Lab Groups

It is expected that you will work in groups in lab. Many of the experiments require several people just to take the data. Groups may contain four or fewer students; obtain instructor permission *each time* for larger groups. All group members are responsible for completing all data tables, graphs, and analyses. Your instructor may check the data sheet of any group member to evaluate the group's work and data collection. The instructor may assign lab groups.

Lab Reports

Written lab reports, when required, are due at the beginning of the next lab.

Resources

Instructor

If office hours are inconvenient, the very best way to contact me is by e-mail. I can pretty much guarantee that I will forget any conversation during or right around class. If I have my wits about me when you speak to me in class, I will ask you to send me an e-mail to remind me of what we discussed. If I forget, please send the e-mail anyway.

Textbook

The textbook is your first source of information. The assigned sections of the text are best read by each student *before* class.

Internet

Current scores for homeworks, labs, and projects will be posted on Infinite Campus. Homework assignments are accessed through Canvas.

Absences

Assessments missed due to an excused absence may be made up. Arrangements for make-up assessments must be made within seven calendar days of your return to class. If you are unable to attend a lab due to an excused absence, contact me. I may either schedule a make-up at another time or pro-rate your missed lab.

Remote learning during extended medical absences

If you are unable to be on campus due to a medical absence, you may participate in the class remotely. However, it is not technically possible for me to deliver the full classroom experience to students attending remotely; when I attend to students physically in lab or lecture, I am not able to optimize cameras, microphones, and narration. Students attending labs remotely may use data gathered from the group in which they synchronously participated, and which they record in their own data tables. Students taking quizzes or exams remotely are subject to the same conditions, including time limits, as if they were physically present.

Academic Integrity

2022-2023 Community Handbook

At MSSM, students and staff take great pride in academic honesty and a supportive academic environment. All are expected to maintain habits of rigorous debate, healthy inquiry, and the vigorous pursuit of truth. Academic dishonesty, in any of its forms, disrupts the learning process and tarnishes the integrity of our community. As a result, MSSM will treat instances of academic dishonesty very seriously.

If an instructor grants permission, students may collaborate in completing assignments and homework. Any unauthorized collaboration, copying, using of notes on exams/major assessments, storing of non-permitted information on calculators or on computers, or any other unacceptable activity that gives a student or a group of students advantages over others is cheating and will not be tolerated.

While the assimilation of ideas from many sources is basic to academic research and intellectual development, students must always reference the use of any non-original materials. Failure to do so is plagiarism and this dishonesty impairs an instructor's ability to accurately evaluate a student's performance. Plagiarism is using someone else's ideas, wording, or data without proper or complete acknowledgment. Credit must be given for ideas and information that belong to someone else, whether it is quoted, summarized, or paraphrased. Faculty members may require that notes, drafts, and a list of sources be submitted along with the finished project. Failure to provide evidence of the work process may constitute an admission of plagiarism.

This class

Students are expected to respect others' opinions and abilities. Those who disrupt the class or interfere with other students' opportunity to learn will be asked to leave the class. If you have a mobile phone or any other distracting equipment, turn it off or silence it and refrain from non-class use during class.

Students are expected to work together on group work and labs, and encouraged to study together. However, all submissions must represent your OWN work. Copying, collaborating, and sharing of materials during examinations is not permitted, as described in detail above. Other prohibited practices include, but are not limited to, signing an absent student's name to a sign-in sheet, submitting material for grading that is also submitted to another class without clearance by both instructors, and "dry-labbing" or recording data in lab that you did not actually observe.

Notice of Non-Discrimination

MSSM does not discriminate on the basis of race, color, national origin, sex, disability, or age in its programs and activities. The following person has been designated to handle inquiries regarding the non-discrimination policies:

Dr Greg Hamlin (he/him/his), Title IX Coordinator, Affirmative Action Officer
Email: hamling@mssm.org
Cell: 607-301-3922

For further information on notice of non-discrimination you may contact the U.S. Department of Health and Human Services, Office for Civil Rights. Web: <https://www.hhs.gov/ocr/index.html>, Phone: 1-800-368-1019, Email: OCRMail@hhs.gov, TDD: 1-800-537-7697

Disclaimer

Information in the syllabus was, to the best of the instructor's knowledge, correct when distributed at the beginning of the term. However, the instructor reserves the right to correct errors and to make changes in the course content or instructional techniques during the term. The instructor will make every effort to ensure that any such changes benefit the students. Before any changes to the syllabus take effect, students will be notified and given the opportunity to comment, object, and propose alternatives.

Semester Planner (Tentative)

Day	Topic	Reading	Assignments
1/23	Penguin Day—no class		
1/24	Syllabus, textbooks; weather variables	1.1–1.3	
1/25	<i>Lab 1</i>		
1/26	Measuring precipitation; station model	1.4–2.1	H1↑
1/27	Surface maps	2.2	P1↑
1/30	Upper level maps	2.3	
1/31	Remote sensing	2.4–2.5	H1↓
2/1	<i>Lab 2</i>		
2/2	Composition of the atmosphere; history	3.1–3.4	H2↑, P1a↓
2/3	Vertical structure and layers	3.5	
2/6	Penguin Day		
2/7	Heat transfer; Light-matter interactions	4.1–4.4.4	H2↓
2/8	<i>Lab 3</i>		
2/9	Project 1 work day		
2/10	Radiation formulas	4.4.5–4.4.7	H3↑ P1b↓
2/13	Stefan-Boltzmann temperatures		
2/14	Atmospheric energy budgets		
2/15	<i>Lab 4</i>		
2/16	Temperature differences	4.5	H3↓
2/17	Thermal physics review		P1c↓
2/18–2/26	Break		
2/27	Water cycle; latent heat	5.1	P2↑
2/28	Water vapor	5.25.5	
3/1	<i>Lab 5</i>		
3/2	Dew point	5.6	H4↑
3/3	Applications of dew point	5.7	
3/6	Adiabatic process temperature changes	6.1–6.3	P2a↓
3/7		6.4–6.8	H4↓
3/8	<i>Lab 6</i>		
3/9		6.9.1–6.9.3	H5↑
3/10		6.9.4–6.9.5, A6.1	
3/13	Project 2 Work Day		
3/14		7.1–7.3	H5↓
3/15	<i>Lab 7</i>		
3/16		7.4	P2b↓

Day	Topic	Reading	Assignments
3/17			
3/20–3/21	break (4-day weekend)		
3/22	<i>Lab 8</i>		
3/23		8.2–8.4	H6↑
3/24	Coriolis force, geostrophic wind	8.5–8.6	P2c↓
3/27	Surface and local winds	8.7–8.9	
3/28	Latitude zones	9.1	P3↑ H6↓
3/29	<i>Lab 9</i>		
3/30	Global circulation	9.2–9.3	H7↑
3/31	Patterns in space and time	9.4	
4/3	Air masses and fronts	10.1–10.2	
4/4	Cyclone development	10.3.1–10.3.2	H7↓
4/5	<i>Lab 10</i>		
4/6		10.3.3–10.3.4	P3a↓ H8↑
4/7	Thunderstorms	11.1–11.2	
4/10	Lightning and lightning safety	11.3	
4/11	Project 3 Work Day		H8↓
4/12	<i>Lab 11</i>		
4/13	Supercells and tornadoes	11.4–11.5	P3b↓
4/14	Tornadoes		
4/15–4/23	Break		
4/24	Hurricanes and cyclogenesis	12.1–12.3	
4/25	Hurricane hazards	12.4–12.5	
4/26	<i>Lab 12</i>		
4/27	Ensemble forecasting	13.1–13.3	P3c↓ H9↑
4/28	Forecast adjustment	13.4–13.6	P4↑
5/1	Forecasting		
5/2	Forecasting		H9↓
5/3	<i>Lab 13</i>		
5/4	Air pollution	14.1	P4a↓ H10↑
5/5	Photochemical smog		
5/8		14.1–14.4	
5/9	Stratospheric Ozone depletion		H10↓
5/10	<i>Lab 14</i>		
5/11	Variability	15.1–15.3	H11↑
5/12	Future climate	15.4–15.8	P5↑

Day	Topic	Reading	Assignments
5/15	Work day		P5a↓
5/16	Work day		H10↓
5/17	<i>Lab 15</i>		
5/18			P5b↓
5/19			
Finals week		P5c (presentation)	↓

↑ = assigned; ↓ = due; a = sign up; b = check in; c = final submission.