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ERTH 303N.50: Weather and Climate

Anna E. Klene

University of Montana, Missoula, anna.klene@umontana.edu

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Earth Science 303N: Weather & Climate Spring 2023 Syllabus

Instructors:

Instructor: Dr. Anna Klene

Email: anna.klene@umontana.edu

Office: Stone Hall 216 & Remote

Office hours: [on Zoom](#), Wed. 2-4 pm & by appt.

Teaching Assistant: Ms. Hilary Schultz

Email: hilary1.schultz@umconnect.umt.edu

Office: CHCB 424 & Remote

Office hours: by appointment

Course objectives:

By the end of this course, you should be able to describe why we have seasons, understand and evaluate the nightly TV forecast for normal and severe weather, and able to explain basic climate change principles to your friends. Additional information is provided for those in the Fire Minor.

Technology:

A good internet connection, basic computer skills, and access to a printer are required. The course is available at: moodle.umt.edu/. For technical assistance, call UOnline (243-4999, M-F, 8-5) or email umonline-help@umontana.edu **Chrome** and **Firefox** are the recommended browsers as others may not save answers on quizzes, homeworks, and exams. Keep Java updated.

Textbook:

Recommended: The Atmosphere: An Introduction to Meteorology, by Lutgens, Tarbuck, & Herman 14th Ed., Prentice Hall, NY. 2019.) A digital interactive e-book of the 14th Ed. is available for a semester rental through the Bookstore for \$40, and the UM Bookstore and online vendors sell a print copy for ~\$170. The 13th Ed. is similar but less expensive with few changes. Several copies of the 13th Ed. and 14th Ed. are on reserve at the library. See Moodle for several free alternative texts to consider as well.

Weekly Deadlines:

There are weekly assignments and quizzes due each Friday.

Schedule:	Topic	Reading	Homework
Week 1-5:	The Science of Meteorology	Ch.1&12 & Appendices	
	Atmospheric Composition & Structure	Ch. 1	Wk. 2
	Radiation & Temperature	Ch. 2 & 3	Wk. 3 & 4
	Temperature Patterns	Ch. 3	Wk. 4
	Air Pollution	Ch. 13	Wk. 5
	Midterm Exam 1	Feb. 23, noon to Feb. 25, midnight	
Week 6-10:	Water in the Atmosphere	Ch. 4	Wk. 7
	Cloud Development & Precipitation	Ch. 5	Wk. 7
	Pressure & Winds	Ch. 6	Wk. 8
	Atmospheric Motion	Ch. 7 & 8	Wk. 9
	Air Masses, Fronts, & Cyclones	Ch. 9 & 12	Wk. 10
	Midterm 2	Apr. 6, noon to Apr. 8, midnight	
Week 11-15:	Severe Weather: Thunderstorms & Tornadoes	Ch. 10	Wk. 11 & 12
	Hurricanes	Ch. 11	Wk. 12
	Climatology & Climate Change	Ch. 14	Wk. 13 & 14
	Exam 3	May 7, noon to May 9, midnight	

Grading Calculation:

Weekly Quizzes	80 pts.	5 pts/week, lowest 1 dropped
Weekly Homework	220 pts.	20 pts each, lowest 1 dropped
<u>3 Midterm Exams</u>	<u>300 pts.</u>	
Total	600 pts.	

***** This syllabus may be modified as necessary during the course. Any changes will be posted in Moodle and distributed by e-mail.****

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Important Dates:

Feb. 6: Last day to drop/add in Cyberbear or change to “Audit” with partial refund.

Mar. 28: Last day to drop w/ drop/add link in Cyberbear (w/ prof & advisor sigs), \$10 fee, & “W” grade.

May 5: Last day to drop w/ link (w/ prof, advisor, & dean sigs), \$10 fee, & “WP” or “WF” grade.

Required assignments and exams:

Reading Assignments – The required reading assignments are listed in the syllabus and online. The text is intended (a) to provide further explanation of concepts covered in lecture videos and (b) to present **additional** information. You are responsible for material in these readings for all exams.

Homework – These are a vital component of this class. They account for **30%** of the final grade. The lowest score will be dropped. The first late one will be excused without penalty for up to one week. **Those submitted late may be penalized 5% off for each calendar day.** We are supposed to ask for documentation to excuse family or medical emergencies, but this spring we will try to be flexible if you contact us promptly.

Quizzes – Weekly to assess material from the reading and videos. These will allow you to get used to the format used for the exams but they also provide an opportunity for feedback. The same policies for late assignments and dropped scores apply to quizzes as well as homework.

Exams – All exams will be comprehensive. Meteorology is a science that builds one concept upon another and therefore all tests refer to what you've learned previously. However, the exams will be oriented toward the section of the course most recently presented. The exam format will be mainly objective (multiple choice and definitions) and will consist of (a) concepts covered in lecture and (b) concepts covered in the required course readings. A few questions may appear on each exam involve calculations or mapping. There is no provision for make-up exams. Exceptions will be made for **documented** family or medical emergencies.

Course guidelines and policies:

Course Syllabus & Communication – Refer to this syllabus and to the Moodle website throughout the course. Any changes to the syllabus will be posted on Moodle and distributed by e-mail. Please note that I am only allowed to use your official UM email or Moodle to communicate with you. This is required to comply with FERPA (the Federal Educational Rights and Privacy Act).

Time Expectations – Online classes do not require classroom attendance, but the amount of time needed to successfully complete the course will be generally the same or more. You are responsible for completing assignments by prescribed deadlines. With this class expect to spend 9-12 hours/week for this course, including reading, videos, assignments, and exams. Incompletes may be given for emergencies, and must be completed within 1 year (<https://catalog.umt.edu/academics/policies-procedures>).

Student Conduct Code – UM’s student conduct code is clearly addressed at: <https://www.umt.edu/student-affairs/community-standards/default.php>. Students failing to follow the code will be reported to the proper offices and receive a failing grade for the course.

Disability modifications – UM assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (<https://www.umt.edu/disability/>). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Equity, please contact ODE in Aber Hall or call 406.243.2243. I will work with you and ODE to provide appropriate modification.

Grading: – At the end of the course, the distribution will be examined and letter grades assigned at approximately: A=>90%, B=80-90%, C=70-80%, D=60-70%, etc. The “+/-” grading system will be used. ***There will be no extra credit of any kind – however, the first and last quizzes function similarly.***

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Assignments (quizzes & homework) are **DUE by Friday at 5 pm each week**. Open work will submit itself automatically at 5 pm. Submit early to have time for questions and technical issues.

It is recommended you complete all homeworks & quizzes for the week **before** taking exam. Exams 1 and 2 are open from **noon** Thursday to **midnight** Saturday night. Exam 3 is open from **noon** Sunday to Tuesday **midnight**. They will close automatically. All exams **MUST** be completed within 75 minutes of the time you begin, **UNLESS** you made arrangements with Anna to have it taken in-person.

Class Calendar:

Date	Reading	Assignments
Week 1: Jan.16 = MLK Day Jan. 16 – Jan. 20	Course Overview Page & Syllabus	Syllabus Quiz
Week 2: Monday, Jan. 23 – Friday, Jan. 27	Ch. 1 (skip ozone depletion) & skim Ch. 12	Week 2 Quiz Week 2 Homework – Atm Characteristics
Week 3: Jan. 30 – Feb. 3	Ch. 2: The Sun & Seasons	Week 3 Quiz Week 3 Homework – Solar Declination
Week 4: Feb. 6 – Feb. 10	Ch. 3: Temperature Patterns & Applications	Week 4 Quiz Week 4 Homework – Energy & Heat
Week 5: Feb. 13 – Feb. 17	Ch. 13: Air Pollution & Ch. 1 section on ozone	Week 5 Quiz Week 5 Homework – Applications
Week 6: Feb. 20 = Pres. Day Feb. 20 – Feb. 24	Ch. 4: Atmos. Moisture (this material is on Exam 2.)	Quiz but NO Homework ☺ - start on Wk 7's Exam 1: noon Thurs – midnight Sat
Week 7: Feb. 27 – Mar. 3	Ch. 5: Atmos. Moisture continued	Week 7 Quiz Week 7 Homework – Humidity & Stability
Week 8: Mar. 6 – Mar. 10	Ch. 6: Wind & 4 Forces	Week 8 Quiz Week 8 Homework – Atm. Forces
Week 9: Mar. 13 – Mar. 17	Ch. 7: Global Circulation Ch. 8: Air Masses & El Niño	Week 9 Quiz Week 9 Homework – Circulation
<i>Spring Break</i>		
Week 10: Mar. 28 – Mar. 31	Ch. 9: Mid-latitude Cyclones	Week 10 Quiz Week 10 Homework – WX Maps
Week 11: Apr. 3 – Apr. 7	Ch. 10: Thunderstorm & Severe WX (This material is on Exam 3.)	NO Quiz; Week 11 Hmwk – Cycl & T-storms Exam 2: noon Thurs – midnight Sat
Week 12: Apr. 10 – Apr. 14	Ch. 10: Tornadoes & Ch. 11: Hurricanes	Week 12 Quiz Week 12 Homework – Tornadoes & Hurricane
Week 13: Apr. 17 – Apr. 21	Ch. 14: Paleoclimate	Week 13 Quiz Week 13 Homework – Paleo
Week 14: Apr. 24 – Apr. 28	Ch. 14: Climate Models	Week 14 Quiz Week 14 Homework – Modeling
Week 15: May 1 – May 5	Climate Change Wrap-up	Week 15 Quiz Feedback Quiz
Exam Week	Exam 3 – available from Sunday noon to Tuesday midnight	

Reference Sheet:

Greek letters used as Variables

Greek Letter	English		
capital	lower	name	equivalent
A	α	alpha	a
B	β	beta	b
Γ	γ	gamma	g
Δ	δ	delta	d
E	ϵ	epsilon	e
Z	ζ	zeta	z
H	η	eta	\hat{e}
Θ	θ	theta	th
I	ι	iota	i
K	κ	kappa	k
Λ	λ	lambda	l
M	μ	mu	m
N	ν	nu	n
Ξ	ξ	xi	ks
O	\omicron	omicron	o
Π	π	pi	p
P	ρ	rho	r
Σ	σ	sigma	s
T	τ	tau	t
Y	υ	upsilon	u
Φ	ϕ	phi	f
X	χ	chi	ch
Ψ	ψ	psi	ps
Ω	ω	omega	\hat{o}

** Δ is often used to refer to the change in something. For instance, ΔP means the change in pressure, so $P_a - P_b$, where a is the first pressure and b is the second.

Refer to Appendix A in your textbook for SI or metric units and conversions.

Order of Operations

1. Simplify any enclosure symbols: parentheses (), brackets [], or braces { }.
 - Work the enclosure symbols from the innermost and work outward.
 - Work separately above and below any fraction bars since the entire top of a fraction bar is treated as though it has its own invisible enclosure symbols around it and the entire bottom is treated the same way.
2. Simplify an exponents and roots working from left to right.
3. Do any multiplication and division in the order in which they occur, working from left to right; *Note: If division comes before multiplication then it is done first, if multiplication comes first then it is done first.*
4. Do any addition and subtraction in the order in which they occur, working from left to right; *Note: If subtraction comes before addition in the problem then it is done first, if addition comes first then it is done first.*

Common Symbols...

- $\sqrt{\quad}$ Square root
- x^2 the 2 is an exponent – this means we should multiply the x by itself (or multiply 2 x's together). An exponent of 3 would mean x times x times x, and so forth. Multiplying like this is also called "raising x to a power."
- π the ratio of circumference to diameter of a circle or about 3.141592653589
- e the natural logarithm base or about 2.718281828459. This is usually used with an exponent (e.g. e^x).

Chemical Notation

- H_2O —means 2 hydrogen atoms & 1 oxygen
- CH_4 – means 1 carbon atoms & 4 hydrogen