

# Introduction to Meteorology and Climatology

## **The Course**

**Soil Science 217**

**Credit Hours: 3**

**Class Number:** 9618

**Time:** MWF 10:00 AM to 10:50 AM

**Location:** 114 Loftsgard

**Textbook:** *Meteorology Today (9<sup>th</sup> Edition)* by Ahrens

*Required: PRS and Psychrometer (See NDSU Bookstore)*

## **The Instructor**

Adnan Akyüz, State Climatologist

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**Phone:** 231-6577

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**Office Hours:** An hour following each class

(Also see the Alternate Hours)

## Course Outline and Tentative Schedule

Week	Session Description
1	<b>Chapter 3: Seasonal and Daily Temperatures</b> <ul style="list-style-type: none"> <li>• Pre-assessment Test</li> <li>• Measuring Temperature</li> <li>• Temperature Scales</li> <li>• Controls of Temperature</li> </ul>
2	<b>Chapter 3: Seasonal and Daily Temperatures</b> <ul style="list-style-type: none"> <li>• Daily and Seasonal Temperature Variations</li> <li>• Global Temperature Distribution</li> </ul>
3	<b>Chapter 4: Atmospheric Humidity</b> <ul style="list-style-type: none"> <li>• Expression of Water in the Atmosphere</li> <li>• Measuring Humidity</li> <li>• Meteorological Observations (Temperature, Wet Bulb, Dew Point and Relative Humidity)</li> </ul>
4	<b>Chapter 2: Energy and Solar Radiation</b> <ul style="list-style-type: none"> <li>• Energy</li> <li>• Solar Radiation and Seasons</li> </ul>
5	<b>Chapter 1: The Earth's Atmosphere</b> <ul style="list-style-type: none"> <li>• Composition</li> <li>• Vertical Structure</li> <li>• Weather and Climate</li> <li>• First Exam</li> </ul>
6	<b>Chapter 5: Condensation</b> <ul style="list-style-type: none"> <li>• Dew, Fog and Clouds</li> </ul>
7	<b>Chapter 6: Atmospheric Stability</b> <ul style="list-style-type: none"> <li>• Determining Stability</li> <li>• Cloud Development</li> </ul>
8	<b>Chapter 7: Precipitation</b> <ul style="list-style-type: none"> <li>• Precipitation Formation</li> <li>• Precipitation Types</li> </ul>
9	<b>SPRING BREAK</b>
10	<b>Chapter 7: Precipitation</b> <ul style="list-style-type: none"> <li>• Precipitation Pattern</li> <li>• Second Exam</li> </ul>
11	<b>Chapter 8: Air Pressure and Wind</b> <ul style="list-style-type: none"> <li>• Air Pressure</li> </ul>

	<ul style="list-style-type: none"><li>• Wind</li></ul>
<b>12</b>	<b>Chapter 10: Global Systems</b> <ul style="list-style-type: none"><li>• General Circulations</li><li>• ENSO</li></ul>
<b>13</b>	<b>Chapter 10: Global Systems</b> <ul style="list-style-type: none"><li>• ENSO</li></ul>
<b>14</b>	<b>Chapter 10: Global Systems</b> <ul style="list-style-type: none"><li>• ENSO Local Impacts</li></ul>
<b>15</b>	<b>Chapter 11: Air Masses and Fronts</b> <ul style="list-style-type: none"><li>• Air Masses</li><li>• Fronts</li></ul>
<b>16</b>	<b>Chapter 11: Air Masses and Fronts</b> <ul style="list-style-type: none"><li>• Weather Maps</li><li>• Third Exam</li></ul>
<b>17</b>	<b>Chapter 19: Atmospheric Optics</b> <ul style="list-style-type: none"><li>• Rainbows, Halos, Sundogs, and Sun Pillars</li><li>• Post Assessment Test</li></ul>
<b>18</b>	<b>FINALS WEEK</b> <b>Final: Wednesday, May 12 (8:00AM - 10:00AM)</b>

<b>IMPORTANT DATES TO KNOW</b>	
<b>FIRST DAY OF THE CLASS</b>	January 12
<b>HOLIDAY</b>	January 17
<b>FIRST DAY OF OBSERVATIONS</b>	February 2
<b>REVIEW I</b>	February 14
<b>EXAM I</b>	February 16
<b>EXAM I BACK</b>	February 18
<b>HOLIDAY</b>	February 21
<b>SPRING BREAK</b>	March 14-18
<b>REVIEW II</b>	March 28
<b>EXAM II</b>	March 30
<b>EXAM II BACK</b>	April 1
<b>HOLIDAY</b>	April 22
<b>HOLIDAY</b>	April 25
<b>REVIEW III</b>	April 27
<b>EXAM III</b>	April 29
<b>LAST DAY OF OBSERVATIONS</b>	April 29
<b>EXAM III BACK</b>	May 2
<b>LAST DAY OF CLASS</b>	May 6
<b>FINAL EXAM</b>	May 11 (8:00-10:00 AM)
<b>GRADE ACCESS ONLINE</b>	May 20

# Everything to Know About the Grading

## Grading Distribution:

Range	Grade
90-100	A
80-89	B
70-79	C
60-69	D
0-59	F

## Grading Policy:

In my eye, everyone is equal and deserves the highest opinion. To give you a little **motivation**, in this class, you will not work hard to get the perfect grade. Instead, you will work hard to maintain the perfect grade. To show you how sincere I am to motivate you, please see the special bonus you initially have in your account.

## Special Bonus:

Everyone in this class will initially receive 100% perfect score to use as a fourth (virtual) exam. To keep it in your account, all you have to do is to maintain an average grade of at least **85%** on all exams and homework assignments independently.

## Grading Method

- 3 Exams (and the bonus—if you qualify) \* 60%
- Homework Assignments 20%
- Either:
  - Final Exam (Comprehensive) 20%
 Or
  - Observations (Temperature and Humidity) 20%

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\* You must maintain average of at least **85%** on all exams, homework assignments in order to qualify for the bonus (See the special bonus above).

## Homework Assignments

I believe that one of the best ways to understand new information is to apply it. There will be a number of homework assignments, consisting of short answer essay questions and/or calculation problems, will be assigned regularly. Assignments are designed to help you learn, understand, and apply the basic concepts and principles discussed in class and the text. Simultaneously, they will help improve your thinking skills. Their due date will be announced with each assignment (which is normally one week from the day they are assigned unless otherwise noted in class). They must be turned in on the due date and I will score them.

**Problems should be worked neatly and briefly on "one side of other paper only", unless you are handing in only one sheet.** This makes checking them much easier for me. Please show your calculations so I can give you partial credit. Reasoning involved to solve the problems will be discussed when they are returned. I will solve the problems on the due date so that you know how the problems are solved. **Late work will not be checked and no credit will be given unless prior arrangements have been made or a natural disaster has befallen you.**

Problem sets are not meant to be examinations. If, after some effort, you cannot answer one or more questions, **please stop in my office or call for a quick hint or more.** Working cooperatively on problems with two or more students may be advantageous. **BUT** when others help, don't just copy their work. **Be sure that YOU understand the concepts and reasoning used to arrive at the answer because you will take exams alone!**

## Examinations

In addition to homework assignments, your understanding and application of the material will be evaluated on two examinations. I will allow students to take an exam early or late, **if permission is granted in advance, or there are, in my opinion, extenuating circumstances.** Examinations will consist of, as much as possible, thought-provoking questions that are based on use or application of the general concepts (Mostly multiple choice questions). A thorough understanding of the concepts is necessary. Mathematical formulas and esoteric numbers or details need not be memorized. If you think your examination was scored too harshly, please indicate your concerns and return it to me. I reserve the right to completely re-grade an examination that has been questioned.

## Final Exam

Final exam will include the material covered during the entire semester. Time and the place of the final exam will be announced. If you choose to participate in observation, you do not have to take the final exam. See below.

## Observations

Starting from just after covering the "Atmospheric Moisture" (Chapter 4) you will be taking daily observations. The daily observations consist of:

- Measured Variables: air temperature and wet bulb temperature and,
- Calculated Variables: dew point temperature and relative humidity

Your class materials contain a set of thermometers called (Psychrometer). You must purchase it along with your book and your PRS system. You will learn throughout the semester how to use

the Psychrometer to measure the air temperature and wet bulb temperature. You will then use moisture tables to calculate the dew point temperature and the Relative Humidity. You will be provided a web site to which you will have to enter those 4 values from Monday through Friday. The web site is designed so that you will not be able to enter missing data at a later day. You will not be graded based on accuracy but based on participation. However given temperature and wet bulb, there could be only one dew point and relative humidity. I will make sure that you entered the calculated variables correct. If you complete the semester with no missing data, your observation grade is 100. Each day you miss an observation, you will miss 2%. If you want to, you can use observations instead of the final exam. In this case you do not have to take the final exam. **Meaning that, you can potentially get a 100% on your final exam without taking the final exam if you participate in observation without missing data.**

I strongly encourage you to participate in observation since observations are the backbone of Meteorology and Climatology. In the end, you will have a better understanding of climate data stewardship.

## **OTHER FACTORS AFFECTING THE GRADING DISTRIBUTION**

### **Reward Challenge:**

First 2 minutes of each class, you will be given questions of various topics.

- There will be at least one winner for each day.
- Each winning will increase your average homework assignment grade by 1% (if you have 10 winnings, you will up your homework assignment average by 10%).
- In addition to the above, the following additions will apply:
  - Overall winner will receive 3 extra points to one of his/her exams.
  - First runner-up will receive 2 extra points to one of his/her exams.
  - Second runner-up will receive 1 extra point to one of his/her exams.

### **Attendance:**

Your reward challenge entry each day will prove your attendance.

- Students with perfect attendance record will be able to replace his/her worse homework assignment with 100% perfect score. (For example: you have maintained a perfect attendance until the end of the semester and your worse homework assignment is 20%. I will erase the 20 and replace it with a 100)
- Students with only 1 absence will be able to replace his/her worse homework assignment with 98% score.
- Students with only 2 absences will be able to replace his/her worse homework assignment with 90% score.
- There is no deduction for the days missed. However, even if you could not qualify for the perfect attendance bonus, the more you come to class, the more chance you will have to win a challenge. Most students in the past indicated that “coming to the class was more fun than anything else”



## Other Details to Know About the Course

### Alternate Hours

I will make sure to be available for your class related questions immediately following each class for an hour (**Office Hours**). However, my office door will always be open if you have conflicts with these hours or if you have questions other than what you have seen in the classroom. You may stop in at any time for help. You may want to call first to make sure I'll be in, but if someone is in my office they have priority. Please come prepared with questions that show you have tried.

### Prerequisites

This is a science course approved for the General Education Science and Technology category. You are required to take Math 103 prior to registering for this course. It will help you learn (meaning understand) basic science/meteorology concepts and principles, and to help you improve your synthesis of information, and critical thinking skills. If you have not taken Math 103 but you have taken an equivalent or more advanced math course you may be allowed to register. Please see the instructor to get a waiver. You will also get as much help from me as you need throughout the semester for areas you may struggle.

Meteorology is an applied science that is based almost totally on chemistry, physics, and mathematical principles. My 217 students have majored in myriad diverse disciplines representing all NDSU Colleges. I know many of you have not taken many science courses, but that's irrelevant because many (most) of the principles and concepts we cover will still be totally new to most students. Thus, learning and understanding will take significant effort for all of us, but it will be exciting. Just think—knowing what causes dew, rain, snow, lightning/thunder, etc; where storms get their energy, and why the wind blows is empowering and exciting and fun. It's fun to understand stuff and we will have fun in class.

### Course Objectives (Intended Course Outcomes)

After class completion, students will be able to explain the causes of numerous exciting, dramatic, destructive, and/or beautiful weather phenomena that surround them daily. These include, but are not limited to; wind, clouds, fog, precipitation, dew, rainbows, mirages, thunderstorms, hurricanes, lightning, thunder, tornadoes, etc., etc.

Students will understand surface synoptic weather maps they see on TV, and be able to relate them to the concepts and principles we discussed throughout the semester. They will also be able to relate them to current weather conditions, forecasts, and bad forecasts.

This is a General Education Course in "Science and Technology" under physical science, approved for Outcomes 5 and 6:

Outcome # 5: Comprehend concepts and methods of inquiry in science and technology, and their applications for society.

Outcome # 6: Integrate knowledge and ideas in a coherent and meaningful manner.

We will have number of activities in the classroom that will ensure of these outcomes. For example, we will go outside and measure temperature and wet-bulb-temperature to calculate dew point temperature and discuss the difference between dew point temperature and relative humidity. In addition, we will bring the latest technology in measurement of atmospheric conditions to the classroom and discuss what that principles are utilized to make the technology work. Students will be encouraged to think of other principles that can be utilized to quantify other variables, such as the amount of moisture in the atmosphere. One of the most popular activities we perform in the classroom is creating artificial tornado inside a tornado machine. After discussing the most favorable conditions for tornado formation, students will be ask to explain how the tornado forms in the box and how they can be related to the real situation outside.

Instructor questioning, discussions, homework problems, exams, and controversial climate issues such as “Climate Change” and “Global Warming” will provide practice for students to enhance their critical reading and thinking throughout the semester.

Students will understand the general concepts/principles well enough so they can synthesize facts and details **and apply them in other, often unrelated, situations.**

Students will also be able to relate the concepts and principals to personal weather observations.

My hope is that students’ interest, curiosity, and excitement in truly seeing and understanding their environment, and also learning and understanding more about science in general will be enhanced because understanding our surroundings is exciting. My hope is they will develop science and nature interests that last a lifetime.

### Source Materials

**Textbook:** *Meteorology Today (9<sup>th</sup> Edition)* by E. Aguado and J. E. Burt, Prentice Hall. It is not required, but suggested and is available at the Varsity Mart.

**Supplemental Material on BlackBoard and/or Distributed in Class:** The syllabus, course outline/schedule, problem sets, grade scores, figures and note outlines used in class, and other information will be on BlackBoard: (<https://bb.ndsu.nodak.edu>).

### Teaching Philosophy

People who have memorized a great many facts are not necessarily well educated. Educated people can synthesize facts and information to draw logical conclusions and apply their knowledge in different situations. **Throughout this course, I will insist that you practice thinking, reasoning, and applying the concepts.** I also believe students learn best when they are actively involved in the classroom, they are treated as equals, their efforts are fairly assessed, and the instructor has high, but reasonable expectations of them. Students should be able to think freely, to discuss opinions openly, and to disagree with me or each other, without fear of recrimination or intimidation both in and out of the classroom.

Ultimately, you should be able to apply the broad general concepts because these are all you will remember 2, 5, or 10 years from now. Details and facts are still important; after all, concepts and principles are built from facts and details. But you can always look them up. The key is to understand enough so you will know when the concepts are applicable.

### Teaching Method

My teaching method consists of lectures, questions, discussions, more questions, and demonstrations. During class I will often call on students to ask questions in order to stimulate thought and discussion. **My intent is to encourage you to think about the topics and concepts, to become actively involved, and not just passively take notes. If you don't understand the concepts covered in class the problem sets will be very difficult or impossible for you.** If you don't have an answer for my question, just say so; and I will rephrase the question, ask you a leading (easier) question, or call on someone else. I am not trying to intimidate, belittle, or embarrass you. But I am pushing you to think about the topics and concepts.

If you have any questions about presented material or want to discuss or clarify a point, feel free to interrupt at any time. **Remember that at least 20 or 30 others probably have the same question! The only dumb questions are those that are never asked.**

My teaching method has been developed and revised over many years and is continually being refined based on regular feedback from my students and things I've learned from various workshops, publications, and experience. However, every year I experiment with the course. I tinker, tweak, revise, and hopefully improve notes, problems, exams, etc. I joined the campus-wide "Teaching Circle" event where effective instructors share various methodologies to make the teaching more effective. Throughout the semester, you may see one or more peer evaluator observing the class. It is all because I want this course to be the best course you have ever taken. I welcome your suggestions on how to improve.

### Student Responsibility

As a student your job is to attend class, complete assignments, and try to learn and understand the principles and concepts. **ALWAYS ATTEND CLASS!** The 50 minutes you spend in the classroom **is the most important time you will ever spend on this course!** During class we discuss general concepts, examples, demonstrations, and applications which give you hints on how to answer problem-set questions, and what's likely to be on exams. Therefore, attending class will **save you hours of time; you will learn more, understand better, and better scores will just come naturally!** Students also have the responsibility to evaluate the course and my teaching twice during the semester. I always appreciate a conscientious, thoughtful evaluation of what you think is good or bad about the class and my teaching. This improves the class and my teaching.

### Instructor Responsibility

It is my responsibility to teach the course material using a variety of methods so that every student can participate. I will attempt to make the classroom an interesting and exciting place to be, so that you will look forward to attending. It is my responsibility to help when you have questions, to evaluate your problem sets and examinations fairly and impartially, and to return

your work promptly. Questions and problems should be structured and evaluated so that you get credit for what you know instead of penalized for what you don't know. **Although I can present information to you, and discuss it with you, I cannot learn it or understand it for you. That is your responsibility.** Finally, there are so many exciting and interesting topics to cover that there will never be enough class time. Thus, I will try to never miss a class, to start each class on time.

### **Honor Code and Academic dishonesty**

All College of Agriculture students are subject to the Honor System, **and I expect all students in this class to be bound by it.** The Honor System is governed by students and operates on the premise that most students are honest and work best when their honesty and the honesty of others are not in question. It functions to prevent cheating as well as to penalize those who are dishonest. It is the responsibility of the student to report any violations of the honor pledge to the instructor, honor commission, or the Dean of the College of Agriculture. Academic dishonesty will be reported whenever/wherever it is found. Anyone cheating on an exam will receive zero points.

### **Students with Special Requirements**

Any student with any disability or other special need requiring some accommodation in this course should visit with me as soon as possible.