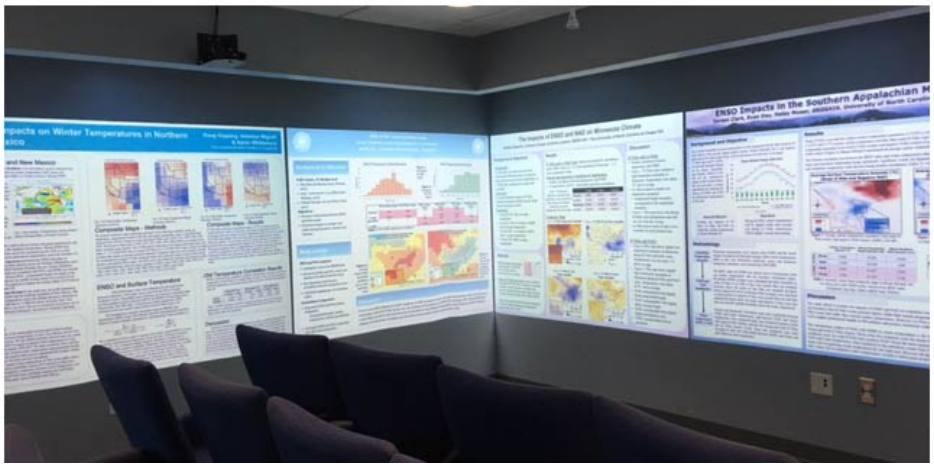
Course Overview

Number	GEOG 416
Title	Applied Climatology: The Impacts of Climate & Weather on Environmental and Social Systems
Credit hours	3
Course Description	Climate intersects with society across a wide range of sectors, including agriculture, water resources, air quality, energy, and human health. Applied climatology is interdisciplinary in nature, involving the application of climatic data and techniques to solve a wide range of environmental problems. In this projects-based course, we will apply data and techniques to understand how climate impacts environmental and social systems. The course is designed around three modules, which this year will be tied to the news-dominating theme of climate extremes: dry extremes (drought), hot extremes (El Niño), and wet extremes (atmospheric rivers).
Prerequisites	none
Target Audience	All Students
Instructor	Dr. Erika Wise Office: 325 Carolina Hall Email: ekwise@email.unc.edu
Course Website	https://sakai.unc.edu/
Class Location, Days, Times	Carolina Hall 322, M 3:35PM - 6:35PM
Office Hours	Monday & Thursday, 2-3:30pm



Course Goals

This course is designed to help you develop problem-solving strategies, technical skills, and disciplinary knowledge in climatology. By the end of the semester, you should be able to:

- Appreciate the breadth of disciplines in which applied climatology plays a role; identify available climate data and describe how this information is collected and synthesized
- Explain current climate issues such as drought, atmospheric rivers, and El Niño
- Explore your own climate-related area of interest in-depth through a "special topics" presentation and the individual research project
- Critically assess published research on applied climatology; interpret formulas, graphs, tables, and schematics, and draw inferences from them
- Formulate research questions concerning applied climatology, identify data and methods that can be used to address those questions, and analyze and interpret a variety of climate data
- Gain experience working as part of a team to answer a research question
- Effectively communicate information and support arguments in three of the most commonly used scientific communication formats: presentation, paper, and poster

As part of the General Education curriculum, this course will address the following Focus Capacities:

1. Natural Science Investigation

Description: *Students learn how to make and interpret scientific descriptions and explanations of the natural world, practice the skills of scientific inquiry, and evaluate scientific evidence within the contexts of both scientific communities and society.*

How does this course fulfill this GenEd? *This is a projects-based course (designated a Research Intensive Course under the previous curriculum) aimed at developing problem-solving strategies, technical skills, and disciplinary knowledge in climatology. Students learn to identify available climate data and describe how this information is collected and synthesized, learn the scientific background of relevant climate issues such as drought, critically assess published research on applied climatology; interpret formulas, graphs, tables, and schematics, and draw inferences from them. Applied climatology explicitly deals with societally-relevant climate information, allowing students to evaluate evidence within the context of both scientific communities and society. Students will gain skills with scientific inquiry through their group projects and individual research project.*

Questions for Students

1. What rules govern the natural world and how are they discovered, tested, and validated?
2. What is distinctive about the approach to understanding employed in the natural sciences?
3. What challenges are encountered in making measurements of the natural world?
4. What are the limits of investigation in the natural sciences?

Student Learning Outcomes

1. Demonstrate the ability to use scientific knowledge, logic, and imagination to construct and justify scientific claims about phenomena, including validation through rigorous empirical testing.
2. Analyze and apply processes of natural scientific inquiry as dictated by the phenomena and questions at hand. These include generating and testing hypotheses or theories; using logic and creativity to design investigations to test these hypotheses; collecting and interpreting data; making inferences that respect measurement error; building and justifying arguments and explanations; communicating and defending conclusions; revising arguments and conclusions based on new evidence and/or feedback from peers; and synthesizing new knowledge into broader scientific understanding.
3. Evaluate science-related claims and information from popular and/or peer-reviewed sources by examining the relationship between the evidence, arguments, and conclusions presented and by assessing consistency with existing knowledge from valid and reliable scientific sources.
4. Identify, assess, and make informed decisions about ethical issues at the intersections of the sciences and society.

2. Communication Beyond Carolina

Description: *Students build capacities for producing and listening to oral communication across a range of contexts. With multiple audiences, they learn to listen to and persuasively convey knowledge, ideas, and information.*

How does this course fulfill this GenEd? *A major component of this projects-based course revolves around oral communication, both individually and as part of a group. Students learn to effectively communicate information and support arguments in three of the most commonly used scientific communication formats: presentation, paper, and poster. Course content includes sections on effective techniques for the different communication styles & potential audiences. Over the course of the semester, students present two group oral presentations, two individual oral presentations, and three group poster presentations. Two digital poster presentation take place in the virtual computing lab of the Odem Institute and students are able to create one printed poster courtesy of the geography department. Poster presentations require different skills than oral presentations, as they require many one-on-one explanations and interactions. Students receive standardized feedback forms on their oral presentations from both their peers and their instructor to encourage improvement over the course of the semester.*

Questions for Students
1. How can I engage with audiences through oral communication?
2. How do I best convey knowledge, ideas, and information effectively to different audiences in situations?
3. How can I best understand the views and ideas of others, both individually and collectively?
4. What are the best ways of strategizing and delivering oral communication for achieving my intended outcomes?
5. How can media or digital compositions extend my ability to communicate?

Student Learning Outcomes
1. Ascertain the expectations, opportunities, and barriers to oral communication in distinct situations.
2. Tailor communications to different kinds of settings, including individual, small group, and public communication.
3. Tailor communications to different levels of expertise (inexpert, informed, expert), and to varying levels of alignment (resistant, ambivalent, supportive) and distinct contexts.
4. Make informed situation- and audience-sensitive strategic choices in content and delivery.
5. Improve ability to move audiences, as measure by best practices, audience feedback, and instructor feedback.

3. Research and Discovery

Description: *Student immerse themselves in a research project and experience the reflection and revision involved in producing and disseminating original scholarship or creative works.*

How does this course fulfill this GenEd? *Students design and execute a data-driven research project from start to finish in this class, with multiple components over the course of the semester that allow for feedback, reflection, and revision. For this research project, students will incorporate data, techniques and information from the class to research an applied climatology topic of interest. Students will pose a research question related to applied climatology, find and acquire data that are relevant to the research needs, and design a set of analyses to answer the research question. To disseminate this information, students will present results to the class in the form of a professional oral presentation and write up a scientific research report. Students will receive feedback from the instructor and their peers on the research question and data sources, providing opportunities to reflect and revise their project.*

Questions for Students

1. How do I establish my point of view, take intellectual risks, and begin producing original scholarship or creative works?
2. How do I narrow my topic, critique current scholarship, and gather evidence in systematic and responsible ways?
3. How do I evaluate my findings and communicate my conclusions?

Student Learning Outcomes

1. Frame a topic, develop an original research question or creative goal, and establish a point of view, creative approach, or hypothesis.
2. Obtain a procedural understanding of how conclusions can be reached in a field and gather appropriate evidence.
3. Evaluate the quality of the arguments and/or evidence in support of the emerging product.
4. Communicate findings in a clear and compelling ways.
5. Critique and identify the limits of the conclusions of the project and generate ideas for future work.

4. Recurring Capacities

How does this course meet the recurring capacities requirements? *This course introduces applied climatology issues in a projects-based, research-intensive format. Students must think deeply about data and uncertainty, and they must evaluate the ways in which climate affects a variety of environmental and societal sectors around the world and in their own communities. For their research projects, they must pose research questions and determine the information and analyses needed to answer those questions. Students will write > 10 pages over the semester (their final project report will be 10 pages, and they will also write answers to discussion questions throughout the semester). Students will be responsible for presenting material to the class through two individual oral presentations, one on an applied climatology topic of their choosing and one on their final research project results at the end of the semester. In addition, they will also work in teams throughout the semester, together analyzing data and presenting results in two group oral presentations and three group poster presentations. Throughout the semester, students will work collaboratively to discuss readings, answer in-class activity questions, and provide peer feedback.*

Graduate Research Consultant

In this research-exposure course, you will be working with a Graduate Research Consultant (GRC), Karly Schmidt (schmidkr@live.unc.edu), who will assist you with the research projects. The GRC Program is sponsored by the Office for Undergraduate Research (http://our.unc.edu). I encourage you to visit the OUR website to learn about how you might engage in research, scholarship and creative performance while you are at Carolina.

Course Design

This course introduces a number of data sets and methodologies that are commonly used by climatologists. We will use a range of computational packages to analyze and visualize climate data (including spreadsheets, statistical software, GIS, and online web tools). These methodologies will be introduced through course content modules and a collaborative learning approach that puts engagement with "real-life" problems at the center of the learning process.

Each of the content modules will be covered over a period of two to three weeks. Over each multi-week period, I will introduce the module topic and provide background information. We will discuss relevant articles on the topic in class. Student teams will work together to brainstorm an approach to the topic and to try out methods and data that could be used to address the research question for the module. During the third week of the module, students will present a status update on their methods and findings. After these presentations, we will address questions and concerns that were raised and help identify resources that will assist in solving any outstanding issues. For each of the three modules, students will produce project reports that summarize background, data, methods, and results in a scientific research format.

Course Materials

There are no required books for this course; all reading materials will be provided on Sakai.
You will need to bring a USB flash drive to class each week, as we will spend a portion of class time working on the module projects.

Course Website:

Syllabus, schedule, announcements, assignments, readings, etc. will be on **Sakai** (https://www.unc.edu/sakai/). Online help for Sakai is available at https://sakai.unc.edu/portal/help/main.

Assessment and Grading

Performance in the course will be assessed through the components listed in the following table:

Component	Total Points	Percent of Final Grade
Discussion questions, participation in in-class activities, and peer evaluation	50	14%
Special topics presentation	40	11%
Module project reports	100	29%
Final research project (multiple components)	160	46%

Grades will be assigned using the plus/minus A-B-C-D-F scale, broken down as follows:
93-100%: A 90-92.99%: A- 87-89.99%: B+ 83-86.99%: B 80-82.99%: B-
77-79.99%: C+ 73-76.99%: C 70-72.99%: C- 67-69.99%: D+ 60-66.99%: D 0-59.99%: F

Graduate student grades will be assigned using the H/P/L/F grading scale. Additional course requirements will be discussed in class.

Discussion questions, participation in in-class activities, and peer evaluation
In order for the module projects to be successful, students need to be able to rely on their fellow team members to collaborate on the assigned tasks. Therefore, full participation throughout each class meeting is required. In-class activities will include work on the module projects, peer evaluations (students will be asked to complete peer assessments in class on multiple days throughout the semester) and discussion questions (I will assign a short set of discussion questions for readings we discuss in class – these will help guide your reading and our discussion). This component of the course grade will be based on student participation in all aspects of the class, including the weekly task assignments, reading discussions, discussion questions, team modules, status updates, and peer evaluation.

Special topics presentation
Students will choose and research an applied climatology sector not covered elsewhere in this class. Potential topics must be approved by the instructor. Students will be responsible for providing an overview and leading discussion on the topic in class on the scheduled date. Additional details will be provided in class.

Module status updates & project reports
During the third week of each module, each team will present an oral status update on their methods and findings. For each of the three modules, students will produce project reports (in the form of virtual and printed poster presentations) that summarize background, data, methods, and results in a scientific research format. The report will be graded based on a combination of research design and presentation quality. Additional details will be provided in class.

Final Project
Each student will be required to complete an individual final project for the course. The final project will involve original data analysis on a topic related to applied climatology and will integrate concepts and skills learned throughout the course. Students will first pose a research question and find appropriate data sources, which they will be able to revise after feedback, design analyses to address the research question, and at the end of the semester present findings through an in-class presentation and a 10-page research paper. Additional details and guidelines will be distributed in class; see below for timeline and point breakdown.

Component	Points	Date & Time Due
Research Question & Data Sources	5	Nov. 13 (3:35pm; hard copy)
Revised Research Question & Data Sources	10	Nov. 27 (3:35pm; upload to Sakai Assignments)
Presentation	45	Dec. 9 (3:30pm; upload to Sakai Assignments)
Final Project Report	100	Dec. 9 (4pm; upload to Sakai Assignments)

Course Policies & Procedures

Attendance
Attendance is *very* important for this class, as we only meet once a week. Your project partners are depending on you to be there for in-class work. Late assignments will not be accepted, except in rare instances covered by University policies, which include absences due to illness, mandatory religious obligations, and certain University activities. Students must provide documentation for these absences in advance, or, in emergency or illness situations, immediately following the absence – documentation will *not* be accepted at the end of the semester. Dates of mandatory religious obligations and approved University activities must be provided *in advance* of the absence.

Classroom Behavior
Participating in class discussion and asking questions are strongly encouraged. If something is unclear, please let me know right away. All cell phones and other electronic devices are to be turned off at the beginning of class, as they can distract other students. We will be meeting in a computer lab, but the monitors will be lowered or turned off when not needed for class purposes. Violation of these basic courtesies or other actions that are disruptive to the class may result in removal from class and loss of participation credit.

Accommodations for Disabilities
A student seeking academic accommodations should first register with the Department of Accessibility Resources & Service and then contact me to make particular arrangements. See http://accessibility.unc.edu/ for more information, policies, and procedures.

The Learning Center
ANY student can benefit from a trip to the UNC Learning Center (http://learningcenter.unc.edu/). They provide academic counseling, study groups, peer tutoring and more – for free. If you are struggling in your classes, or if you just want to be better prepared, the Learning Center is a great place to go for help.

Honor Code
The University of North Carolina at Chapel Hill has had a student-administered honor system and judicial system for over 100 years. The system is the responsibility of students and is regulated and governed by them, but faculty share the responsibility. If you have questions about your responsibility under the honor code, please bring them to your instructor or consult with the office of the Dean of Students or the Instrument of Student Judicial Governance. This document, adopted by the Chancellor, the Faculty Council, and the Student Congress, contains all policies and procedures pertaining to the student honor system. Your full participation and observance of the honor code is expected (http://studentconduct.unc.edu/).

GEOG 416 Course Schedule*

Week	Date	Topic	Assignment
1	28-Aug	Introduction to applied climatology	
2	4-Sep	NO CLASS: LABOR DAY	
3	11-Sep	Module 1a: Dry Extremes - Drought	DQs
4	18-Sep	Module 1b: Dry Extremes - Drought	DQs
5	25-Sep	Module 1c: Dry Extremes - Drought	Status update
6	2-Oct	Special topics in applied climatology	
7	9-Oct	Module 1 Synthesis	Module 1 report
8	16-Oct	Module 2a: Hot Extremes - El Niño	DQs
9	23-Oct	Special topics in applied climatology	
10	30-Oct	Module 2b: Hot Extremes - El Niño	DQs
11	6-Nov	Module 2c: Hot Extremes - El Niño	Status update
12	13-Nov	Module 2 Synthesis & RQ discussion	Module 2 report & RQs
13	20-Nov	Module 3a: Wet Extremes - Atmospheric Rivers	DQs
14	27-Nov	Module 3b: Wet Extremes - Atmospheric Rivers	DQs + Revised RQs
15	4-Dec	Module 3 Synthesis & course wrap-up	Module 3 report
16	**FINAL EXAM PERIOD: Saturday, Dec. 9, 4-7pm**		Project presentations & papers

**The instructor reserves the right to make changes to the syllabus, including due dates, when unforeseen circumstances occur. These changes will be announced in class and on Sakai.*