

**GEO 347G/387G Climate System Modeling**  
**3 Credits: MWF 10 – 11 am**  
**Room: JGB 3.216B**

**Instructor:** Dr. Ned Vizu  
Office: JGB 5.220G  
Office Hours: MW 11am – 12pm and by appointment

**Prerequisites:**

Upper-division standing/graduate student  
Basic knowledge of UNIX and programming experience in Fortran

**Textbook/Materials:**

“An Introduction to Three-Dimensional Climate Modeling” by Warren M. Washington and Claire L. Parkinson. University Science Books

**Description:**

In this course you will study the basic theory of climate system modeling using state-of-the-art WRF regional climate model in a variety of applications. This includes learning how to set-up, run on high-performance computing platforms, and analyze output from the regional climate model to address relevant scientific questions.

**Learning Goals:**

Students will develop computing and data analysis skills to conduct scientific research and address important scientific questions in the climate science field. In addition students will learn how to present their work in oral and written in written form. These skills will be assessed through class presentation of results and the submission of a final report due on the last day of class.

**Syllabus:**

**I. Introduction**

**II. Physical Description of the climate system**

- a. atmosphere
- b. oceans
- c. land surface
- d. cryosphere/ice

**III. Modeling the climate system**

- a. Fundamental equations
- b. vertical coordinate systems
- c. radiation and cloud processes
- d. surface processes

**IV. Basic Methods for solving model equations**

- a. Finite differencing
- b. spectral method

**V. Weather Research and Forecasting Model (WRF)**

- a. Introduction
- b. ARW Solver
- c. WRF Model Physics
- d. WRF Software
- e. Getting started with the TACC Ranger
  - unix/linux commands
  - vi editor

- f. WRF Preprocessing System (WPS)
- g. WRF ARW Initialization
  - Basics
  - How to set up and run
- h. ARW namelist.input
- i. Post-processing and graphical tools (GrADS)

**VI. Research Project** – topic of study is selected by the student with approval by instructor.

**Assignments:** Skill developing assignment exercises will be assigned throughout the semester. These involve developing the computer/software skills, presentation, and writing skills needed to successfully complete the final oral presentation and final written report. These assignments will be critiqued by the instructor, but not assigned a grade. The purpose of these assignments is to develop the student's skills needed to successfully complete the final oral presentation and written project about the research topic chosen for study.

**Grading:** Your final grade for the course will be based on the following components

- Class attendance and participation during the semester ~**10%**
- Oral presentation of project ~ **40%** : Due on Wednesday Dec. 4, 2013
- Written research project ~ **50%** : Due on Friday Dec. 6, 2013

Note plus/minus grades will be used for the final course grades.

**Notice:** students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, <http://www.utexas.edu/diversity/ddce/ssd/>

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The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect towards peers and community. For more detailed information regarding the UT Honor Code please see: <http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html>

### **Policy Regarding Religious Holidays:**

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

### **Emergency Policies:**

Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.

Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.

Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.

In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.

Behavior Concerns Advice Line (BCAL): 512-232-5050

Link to information regarding emergency evacuation routes and emergency procedures can be found at: [www.utexas.edu/emergency](http://www.utexas.edu/emergency)