TR, 1:30-2:45pm (Lectures) Innovation Hall, Room 338 F, 1:30pm – 2:20pm (Lab) Innovation Hall, Room 320 Fall Semester, 2010

Zafer Boybeyi & Brian Doty



- The primary focus in CLIM-301 is to better understand the large-scale behavior of mid-latitude weather systems.
- CLIM-301 will introduce students to the basic tools of weather analysis techniques of weather forecasting.
 Students will acquire the skills needed to analyze and interpret surface and upperair observations, data from satellites and radar, atmospheric soundings, and severe weather indices.



Prereqs: Math at the first year calculus level & CLIM-111/PHYS-111

Goals:

To provide the student with:

- a better understanding of mid-latitude weather systems from both a theoretical and practical viewpoints,
- an understanding of the key steps that go into a forecast, including NWP models, ensemble forecasting technique, data assimilation, and model evaluation and uncertainties, and
- applying concepts from lecture to real world examples via lab assignments.

Course Content:

This course consists of an overview of mid-latitude weather systems, including the fundamentals of atmospheric thermodynamics, radiation, chemistry, and atmospheric dynamics, leading to a discussion of the future of Earth's atmosphere and human impacts.

Emphasis will be placed on both qualitative and quantitative explanations, based upon everyday occurrences, of the processes that control the thermal, dynamical, and chemical state of the midlatitude weather systems.

The laboratory section is designed to enhance learning by applying the information acquired in the lecture portion of the course with practical applications.

The laboratory section will also give students the opportunity to gain practical experience in weather analysis and prediction and to become familiar with some of the technology currently used for visualization and analysis.

Required Texts:

 The Atmosphere: An Introduction to Meteorology, Tenth Edition
 Frederick K. Lutgens & Edward J. Tarbuck Pearson/Prentice Hall, 2006, ISBN 0-13-187462-4

Mid-Latitude Weather Systems

 T. N. Carlson
 American Meteorological Society, 1998
 ISBN 978-1-878220-30-1



Atmosphere



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FORMAT:

Lecture Section (3 credits): There will be approximately one lecture topic covered per week. These lectures will include class discussion of topical issues.

Selections from the Textbook of F. K. Lutgens and E. J. Tarbuck, and its order of presentation, will provide the basic framework of most of the qualitative discussions, while the T. N. Carlson text will provide quantitative material.

Laboratory Section (1 credit): The Laboratory section will provide insight into mid-latitude weather systems via lab exercises and weekly weather map and forecast discussions. The Laboratory exercises are chosen to parallel the lecture topics and discussions.

Class format will consist of:

- Lectures covering material in the required texts,
- Homework and laboratory assignments
- Reading assignments both from the text and supplemental material,
- Group discussion
- Midterm exam
- Final exam

Learning Outcomes

Course Outcomes: By the end of the semester this course student will have developed a basic understanding of the following:

- > Characterization of temperature and it variation in the atmosphere.
- Solar influences and heating which drive atmospheric thermodynamics and motions (i.e., weather systems)
- Earth's energy budget.
- > Atmospheric moisture and the role of water in weather considerations.
- Mid-latitude weather systems
- > The ability to work with atmospheric observations
- > The ability to read and interpret weather maps
- > The ability to understand numerical weather prediction products

Course Websites:

- <u>http://camp.cos.gmu.edu/CLIM-301.html</u> (Syllabus, lecture notes, etc.)
- <u>http://wx.gmu.edu</u> (Current weather and historical weather analysis & forecasts, etc.)

Instructors and Contact Information



Prof. Zafer Boybeyi Research I, Room 217 Mail Stop 6C3 **Email: <u>zboybeyi@gmu.edu</u>** Phone: (703) 993-1560 FAX: (703) 993-9229 Mr. Brian Doty Email: <u>bdoty@gmu.edu</u> Phone: (301) 595-7000 FAX: (301) 595-9793

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Office Hours

Prof. Zafer Boybeyi

Office Hours: Tuesday: 10:30am – noon Thursday: 10:30am - noon Additional hours by appointment

Fall 2010: Tentative Travel None at this time.

Mr. Brian Doty

Office Hours: Friday: 10:30 – noon Additional hours by appointment

Fall 2010: Tentative Travel None at this time.

Tentative Grading Policy:

- Lab Assignments & Homework: 25%
- Midterm: 25%
- Final exam: 40%
- Participation: 10%

You are responsible for all material from the text, and any additional assigned readings.

Midterm Exam:

- Thursday, Oct. 14 (1:30pm 2:45pm)
 Final Exam:
- Thursday, Dec. 16 (1:30pm 2:45pm)

Tentative Lecture Schedule

- (1) Aug. 31 & Sep 2: Introduction, Observations, Temperature, Heating Earth's Surface and Atmosphere (Lutgens & Tarbuck)
- (2) Sept. 7 & 9: Moisture and Atmospheric Stability (Lutgens & Tarbuck)
- (3) Sept. 14 & 16: Forms of Condensation and Precipitation (Lutgens & Tarbuck)
- (4) Sept. 21 & 23: Air Pressure and Winds (Lutgens & Tarbuck)
- (5) Sept. 28 & 30: Circulation of the Atmosphere (Lutgens & Tarbuck)
- (6) Oct. 5 & 7: Air Masses, Weather Patterns (Lutgens & Tarbuck)

Oct. 12: Columbus Day Recess

Oct. 14: Midterm Exam

- (7) Oct. 19 & 21: SkewT-LogP Diagram (Notes) & Mathematical Definitions (Carlson)
- (8) Oct. 26 & 28: Vorticity and Vertical Motion (Carlson)
- (9) Nov 2 & 4: The Vorticity and Thermodynamic Equations (Carlson)
- (10) Nov. 9 & 11: Quasi-Geostrophic Forcing (Carlson)

(11) Nov. 16 & 18 & 23: Mid-Latitude Weather Systems; Barotropic Viewpoint (Carlson) Nov. 25: Thanksgiving Recess

(12) Nov. 30 & Dec. 2: Mid-Latitude Weather Systems; Baroclinic Viewpoint (Carlson)
(13) Dec. 7 & 9: Numerical Weather Prediction (Notes)

Dec 16: Final Exam

Tentative Lab Schedule

Each laboratory session will begin with a weather map and forecast discussions Responsibility for leading the discussions will be rotated among the students and instructor.

- (1) Sep 3: Observational elements, map contouring
- (2) Sept. 10: Data decoding
- (3) Sept. 17: Surface map analysis
- (4) Sept. 24: 850 mb map analysis
- (5) Oct. 1: 700 mb map analysis
- (6) Oct. 8: 500 mb map analysis
- (7) Oct. 15: 300/200 mb map analysis
- (8) Oct. 20: Thickness chart analysis
- (9) Oct. 22: Radar imagery, satellite images, and interpretation
- (10) Oct. 29: Skew-T analysis
- (11) Nov 5: Human forecasting
- (12) Nov. 12: Numerical weather prediction
- (13) Nov. 19: Numerical weather prediction

Nov. 26: Thanksgiving Recess

- (14) Dec. 3: Severe weather forecasting
- (15) Dec. 10: Winter weather forecasting

Dec 16: Final Exa

Useful Websites

- NOAA Headquarters Gateway <u>http://www.noaa.gov/</u>
- NESDIS (NOAA Satellite and Data Information Service) <u>http://www.nesdis.noaa.gov/</u>
- NESDIS GOES Image Server <u>http://www.goes.noaa.gov/</u>
- NESDIS Significant Event Images <u>http://www.osei.noaa.gov/</u>
- NOAA Forecast Systems Lab Data Gateway http://www.fsl.noaa.gov/data/
- NOAA-FSL RAOB Database http://raob.fsl.noaa.gov/
- WMO Model Grid Specifications http://www.nco.ncep.noaa.gov/pmb/docs/on388/tableb.html
- National Weather Service (NWS) <u>http://www.weather.gov</u>
- NCEP-HPC/NWS Forecast Discussion Pages http://www.hpc.ncep.noaa.gov/html/discuss.shtml
- NCEP-HPC/NWS Short-Range Daily Forecast Discussion <u>http://www.hpc.ncep.noaa.gov/discussions/pmdspd.html</u>
- National Center for Atmopsheric Reseach (NCAR) Data NCAR Mesoscale and Micromet Division MM5/WRF Model Output <u>http://rain.mmm.ucar.edu/mm5/</u>
- Research Applications Program (NCAR-RAP) Real-Time Weather Page http://www.rap.ucar.edu/weather/
- RAP's Great BIG Global Weather Station Identifier Page http://www.rap.ucar.edu/weather/surface/stations.txt
- Center for Ocean-Land-Atmosphere Studies (COLA) Weather and Climate Data http://www.iges.org/pix/pix.html
- UNISYS Weather Pages http://weather.unisys.com/
- American Meteorological Society (AMS) <u>http://www.ametsoc.org/</u>
- Wyoming Weather Web Pages http://weather.uwyo.edu/
- The Weather Channel Homepage http://www.weather.com/
- Weather Data Archives NOAA National Climatic Data Center (NCDC) <u>http://www.ncdc.noaa.gov</u>
- NCAR MMM Case Archives http://locust.mmm.ucar.edu/case-selection/
- NOAA Daily Weather Map Archives http://docs.lib.noaa.gov/rescue/dwm/data_rescue_daily_weather_maps.html
- NCEP-SPC Storm Reports <u>http://www.spc.noaa.gov/climo/</u>
- NCEP-SPC Current and Archive Maps http://www.spc.noaa.gov/obswx/maps/
- UNISYS Weather Pages http://weather.unisys.com/
- Wyoming Weather Web Archives http://weather.uwyo.edu/

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GMU Honor Code

Honor Code To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this Honor Code Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

http://www.gmu.edu/departments/unilife/pages/honorcode.html

Important Dates:

September 14 – Enrollment Deadline. This is the last day to add into a course. Students may not register into any section after this date. No exceptions. This is also the last day to drop a course without losing tuition money.

September 21 – Drop Deadline. This is the last day a student may drop a course. Students will receive a 33% tuition refund. After this date, students may withdraw from a course, but only according to strict guidelines.

Students with Disabilities

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474.

All academic accommodations must be arranged through that office.

