

ATOC 6700: Weather Forecasting Spring 2016

Course Goals

ATOC 6700 focuses on critical thinking and the ability to build a cohesive, physical “story”, or conceptual model, from limited weather data. The course will require students to apply the concepts learned in the ATOC graduate core classes, particularly ATOC 5050 and 5060, to real weather data with the goal of forecasting the weather 2 to 3 days into the future. Students will develop conceptual models of how atmospheric features, over the depth of the troposphere, impact the sensible weather at the surface of the earth. These conceptual models will be used to evaluate a suite of observational and forecast model products to produce forecasts of temperature and precipitation at Denver and Chicago. While the ultimate, tangible goal of this class is to forecast the weather this class will also help students build the necessary skills to critically analyze and interpret observational and model data, describe their analysis and interpretation in both oral and written formats, develop hypotheses and forecasts based on conceptual models of atmospheric behavior, and test these hypotheses. These are skills necessary for being a successful scientist.

At the end of the semester students will be familiar with:

- Real-time operational weather data available online
- Numerical weather prediction model output and other forecast guidance products
- Large-scale features that impact local weather
- Local features that impact local weather

At the end of the semester students will be able to:

- Analyze observational and model data to:
 - Identify the key features that will impact the short-term (several day) evolution of sensible weather at the surface of the earth
 - Develop conceptual models of the atmospheric behavior that are based on available observational and model data
 - Make short-term forecasts of temperature and precipitation
- Present their analysis in both oral and written formats
- Evaluate the successes and failures of their conceptual models and quantitative forecasts of the atmosphere’s evolution

Contact Information and Office Hours

Professor: Dr. John Cassano

Classroom: MacAllister / SEEC N129

Meeting Time: Tuesdays 1230PM to 145PM

Class web site: <http://storm.colorado.edu/~cassano/atoc6700>

Office: MacAllister / SEEC C279

Office Hours: Tuesdays 11:00AM to 12:00PM and by appointment

Professor Cassano’s e-mail: john.cassano@colorado.edu

Feel free to contact me if you have any questions or concerns regarding this class. I will have one regularly scheduled office hour per week and you can also contact me via e-mail. If you need to meet with me at a time other than during my normal office hours please e-mail to setup a time to meet.

If you send me an e-mail during the semester you should receive a response from me within 1 to 2 days. If you do not receive a response it is likely that I did not receive your e-mail.

If you discuss anything with me before or after class please follow up with an e-mail to confirm the conversation.

Class web site

The class web site contains a description of the course and forecasting contest, the course syllabus, guidelines for the in-class and written forecast discussions, a schedule of class lectures, a guide and links to useful weather web sites, archived observational and forecast guidance products, and the forecast entry page.

Course Materials

There is no textbook for this course. A Powerpoint presentation with a brief review of weather forecasting and online weather products, guidelines for the weekly weather discussion, and an overview of useful weather products available online are posted on the class web page. These items will be the basis for the first classes of the semester. Professor Cassano's Powerpoint weekly forecast discussions will also be posted on the class web page.

Students may wish to review the UCAR COMET MetEd website (<https://www.meted.ucar.edu/index.php>) for lessons related to weather forecasting and numerical modeling. Some lessons that may be useful are listed at the end of the syllabus.

Course Requirements

Students are expected to attend and actively participate in all lectures. Students that will miss a lecture should let Professor Cassano know before the scheduled class. A student's final course grade will be reduced if the student misses more than one lecture during the semester or fails to participate in the class discussions in a meaningful way.

Starting on 19 January students will submit weather forecasts for Denver and Chicago by 6PM each Tuesday of the semester (except during spring break). See below for details about the forecasting contest.

Students will be called on to discuss specific aspects of the previous week's forecast or the upcoming forecast during each week's class period starting on Tuesday 16 February. A significant portion of the final class grade will be based on these in class discussions. Students will also be required to submit a written forecast discussion several times throughout the semester. Guidelines for the in-class and written forecast discussions are available on the class web page.

Forecasting Contest

The ATOC 6700 weather forecasting contest will be conducted once per week. Each student will make a forecast for Denver International Airport and for O'hare Airport in Chicago, IL for two 24 hour periods, with the forecast period starting at midnight (local time - LT) on Wednesday. The day 1 forecast will be for the time period 12:00AM LT Wednesday through 11:59PM LT Wednesday. The day 2 forecast will be for the time period 12:00AM LT Thursday through 11:59PM LT Thursday.

For each forecast period the minimum temperature, maximum temperature, and a precipitation category are to be forecast. Temperatures will be forecast to the nearest whole degree Fahrenheit. Precipitation (liquid water equivalent) categories are:

- Cat. 0 -- no precipitation or trace
- Cat. 1 -- trace - 0.05", inclusive
- Cat. 2 -- 0.06-0.24", inclusive
- Cat. 3 -- 0.25-0.49", inclusive
- Cat. 4 -- 0.50-0.99", inclusive
- Cat. 5 -- ≥ 1.00 "

The forecasts must be submitted no later than 6PM MT on Tuesday. The forecasts are submitted by following the [Forecast Entry](#) link on the class web page.

Forecasts will be scored based on the following. One error point is accumulated for each degree Fahrenheit that the forecast temperatures deviate from the NWS climate data minimum or maximum daily

temperature. Four error points are accumulated for each precipitation category that the forecast precipitation deviates from the NWS climate data daily liquid equivalent precipitation amount. In the event that a trace of precipitation verifies both category 0 and 1 are accepted as correct forecasts. NWS daily climate data at Denver International Airport (KDEN) and Chicago O'hare Airport (KORD) will be used to verify the forecasts. Weekly forecasting contest results will be posted for each city after the forecasts are verified.

All forecasters who do not submit a forecast by the 6:00 p.m. MT deadline will receive a persistence forecast. Forecasters that know they will miss a forecast period can request that a standardized forecast (NWS grid, NAM MOS, GFS MOS, etc.) be submitted for them by e-mailing the course instructor (john.cassano@colorado.edu) prior to the forecast deadline. Students enrolled in ATOC 6700 will be allowed to miss a maximum of 1 forecast period during the semester before receiving a reduced grade for the class.

Assignments and Grading

Your final grade in this course will be based primarily upon your contributions to the weekly in-class discussions and your written forecast discussions. Your overall course grade will be reduced by failure to attend class, lack of meaningful contribution to the weekly discussions, or failing to submit forecasts for the weekly forecasting contest. Guidelines for the weekly discussions and written forecast analysis are available on the class web page.

The forecasting contest will begin on Tuesday 19 January and forecasts must be submitted by 6PM MT each Tuesday of the semester, except during spring break (22 March). Students will not be graded on the accuracy of their forecasts. Instead, grading of the forecasting contest will be based on the student's ability to develop a physically plausible basis for their forecast, their ability to critically assess the successes and failures in their forecasting logic based on the observed weather during the forecast period, and their ability to explain the rationale for their forecast during the in-class discussions and in the written forecast discussions.

Written forecast discussions must be submitted via e-mail to Professor Cassano by 6PM MT on 2 February, 9 February, 5 April, 19 April, and 26 April. The first two written forecast discussions will not count towards the final class grade and will only be "graded" by Professor Cassano to provide students with guidance regarding expectations for these written assignments. The final three written forecast discussions (starting on 5 April) will count towards the final class grade.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to [the academic integrity policy](#) of the institution. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible of violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at <http://honorcode.colorado.edu>.

All students caught violating the honor code in this class will receive a final class grade of F. Cheating and academic dishonesty will not be tolerated in this class.

Students with Disabilities

If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see [Temporary Injuries guidelines](#) under the Quick Links at the [Disability Services website](#) and discuss your needs with your professor.

Religious Observances

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please contact Professor Cassano at least two weeks before any conflicts with religious observances to arrange alternate accommodations.

See [campus policy regarding religious observances](#) for full details.

Classroom Behavior Policy

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the [policies on classroom behavior](#) and [the student code](#).

University of Colorado Policy on Discrimination and Harassment

The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. CU-Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU-Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the [OIEC website](#).

How to succeed in this class

- Attend all lectures and actively participate in the lectures by asking and answering questions
- Ask for help if you don't understand something
- Review the current weather and forecast products before attending class each week
- Be sure to submit your weather forecasts on time (by 6PM MT) each week
- Make sure that your written forecast discussions are logically organized and tell a physically plausible "story" regarding the evolution of the sensible weather at the forecast cities
- Critically evaluate your weekly forecasts after each forecast period ends
- Be prepared to discuss all aspects of the previous week's forecast and the upcoming forecast at each class.
- Contact Professor Cassano as soon as possible if you have any questions or concerns about this class

ATOC 6700 Weather Discussion Schedule (Spring 2016)

12 January	Cassano review of forecasting and forecasting products available online
19 January	Cassano forecast discussion / Start of forecasting contest
26 January	Cassano forecast discussion / Forecasting contest
2 February	No class: Forecasting contest / Students submit written forecast discussion
9 February	No class: Forecasting contest / Students submit written forecast discussion
16 February	Week in review and forecast discussion / Forecasting contest
23 February	Week in review and forecast discussion / Forecasting contest
1 March	Week in review and forecast discussion / Forecasting contest
8 March	Week in review and forecast discussion / Forecasting contest
15 March	Week in review and forecast discussion / Forecasting contest
22 March	No class - Spring break
29 March	Week in review and forecast discussion / Forecasting contest
5 April	No class: Forecasting contest / Students submit written forecast discussion
12 April	Week in review and forecast discussion / Forecasting contest
19 April	No class: Forecasting contest / Students submit written forecast discussion
26 April	No class: Forecasting contest / Students submit written forecast discussion

Meeting time and location:

Tuesdays 1230 to 145PM, MacAllister / SEEC N124

Since the ATOC 6700 lectures are 1:15 in length we will only have 10 class meetings during the semester. This gives us the same amount of class meeting time as 15 50 minute lectures.

Forecasts are due by 6PM MT on Tuesdays starting on Tuesday 19 January

Written forecast discussions due by 6PM MT on Tuesdays when no class is held.

Professor Cassano will lead the forecast discussions on 19 and 26 January. Starting with the forecast discussions on 16 February students will be called on to discuss individual aspects of the previous week's forecast and the upcoming forecast. All students should be prepared to discuss all aspects of the week in review and upcoming forecast for these weeks.

Updated: 16 December 2015

UCAR COMET MetED Courses

NWP and Forecasting

NWP essentials: NWP and forecasting:
https://www.meted.ucar.edu/training_module.php?id=1153

How NWP fits into the forecast process:
https://www.meted.ucar.edu/training_module.php?id=755

Preparing to evaluate NWP models:
https://www.meted.ucar.edu/training_module.php?id=776

Analysis, diagnosis, and short-range forecast tools:
https://www.meted.ucar.edu/training_module.php?id=775

Optimizing the use of model data products:
https://www.meted.ucar.edu/training_module.php?id=778

Determining plausible forecast outcomes:
https://www.meted.ucar.edu/training_module.php?id=777

Adding value to NWP guidance:
https://www.meted.ucar.edu/training_module.php?id=779

Effect use of NWP in the forecast process: Introduction:
https://www.meted.ucar.edu/training_module.php?id=707

Quantitative precipitation forecasting overview:
https://www.meted.ucar.edu/training_module.php?id=59

NWP background

Operational models encyclopedia:
https://www.meted.ucar.edu/training_module.php?id=1186

Ten common NWP misconceptions:
https://www.meted.ucar.edu/training_module.php?id=1

Ensemble forecasting

Introduction to ensemble prediction:
https://www.meted.ucar.edu/training_module.php?id=170

Ensemble applications in winter:
https://www.meted.ucar.edu/training_module.php?id=1073