

# Syllabus: METO 497A - Air Quality Forecasting

## Instructor:

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**Note:** This is a new course – changes and additions may occur to this syllabus and it will be reissued in that case.

**Goal:** The goal of this course is to provide the students with a practical understanding of current techniques in operational air quality forecasting.

**Class Structure:** Each class will combine a lecture with weather map discussions and forecast preparation and verification. At some point in the semester, gradable map discussions will be presented by the students.

**Office Hours:** 0900-1100 MW, or by appointment with the instructor.

## Expectations and Grading:

1. Attendance is mandatory	10%
2. Gradable Map Discussions (1-2)	20%
3. Forecasts and Verification	15%
4. Quizzes (every other week)	30%
5. Class presentation on an assigned topic <sup>a</sup>	20%
6. Class participation and feedback <sup>b</sup>	5%

**Note:** Changes in class structure may alter the weights of grades noted above.

<sup>a</sup>Students will present a short Power Point presentation on an instrument used in air quality data collection.

<sup>b</sup>This is a new course, feedback from the students is essential to improving the class.

**Academic Integrity:** This course adheres to the Earth and Mineral Science Academic Integrity Policy as described at:

<http://www.ems.psu.edu/students/integrity/index.html>.

## **Class Outline – METO 497A**

1. Introduction and Background
2. What are we forecasting?
  - a. Criteria pollutants
  - b. Toxic pollutants
3. How are forecasts used?
  - a. Users of forecasts
  - b. Dissemination of forecasts
  - c. Color codes and the AQI
4. Introduction to PM<sub>2.5</sub> – Health effects
  - a. Current basic knowledge
  - b. Critical studies
5. Introduction to PM<sub>2.5</sub> – Chemistry
  - a. Formation of particles
  - b. Sources and sinks
  - c. Speciation of PM<sub>2.5</sub>
6. Introduction to PM<sub>2.5</sub> – Meteorology
  - a. Conducive weather patterns
  - b. Key forecast issues
7. Introduction to PM<sub>2.5</sub> – Instruments
  - a. Preparation for class presentations
8. Forecasting PM<sub>2.5</sub> – Current Methods
  - a. Statistical methods in use
  - b. Conceptual models
  - c. Improvements?
9. Forecasting PM<sub>2.5</sub> – Numerical Models
  - a. Current situation
  - b. Ideal model?
10. Forecasting PM<sub>2.5</sub> – Verification and Forecast Skill
  - a. Metrics for assessing forecast skill
11. Introduction to O<sub>3</sub> – Health effects
12. Introduction to O<sub>3</sub> – Chemistry
  - a. O<sub>3</sub> chemistry basics
  - b. O<sub>3</sub> precursors: Sources and sinks
13. Introduction to O<sub>3</sub> – Meteorology
  - a. O<sub>3</sub> conducive weather patterns
  - b. Key forecast parameters
14. Forecasting O<sub>3</sub> – Current Methods
  - a. Statistical methods
15. Forecasting O<sub>3</sub> – NOAA/EPA Numerical Model
  - a. Model framework and description
  - b. Model skill to date
16. Class Presentations