SYLLABUS

Spring 2012

ENVR 890-5

Measurement of NOx, O3, and Volatile Organic Compounds

Time and location: Wednesday, 1:00 – 1:50 p.m., McGavran-Greenberg 2303

Instructor: Kenneth G. Sexton (McGavran-Greenberg 4114B)

Email addresses: ken_sexton@unc.edu

Office hours: After class or by appointment

Course Description and Objectives

Course Motivation: These major air pollutants are measured to not only fulfill regulatory requirements, but to investigate relationships of these important pollutants which impact atmospheric reactivity and health effects. This course first reviews the legal requirements and the official documentation of the prescribed methods. But most of the course focuses on understanding the methods, and the concerns for implementing the methods, including calibration and precautionary maintenance procedures, data acquisition and processing, which will result in trustworthy data. The course also covers theory of operation of the methods, and basic measurement theory. Special optional methods of sample collection and processing are also covered.

Course Objectives: This course is intended to develop a student's ability to operate the primary instruments for measuring these important pollutants, collect and process samples where necessary, record data, and process instrument data into final air concentration data. Laboratories will provide hands-on opportunities to, operate instruments in a research laboratory, including calibration, measurement of mixtures, investigate chemical interferences, and operational concerns to avoid measurement errors.

Prerequisites

Some nominal laboratory skills and lab safety training and registration (30 days to comply)

Course Requirements and Evaluation

Class participation	40%
Homework assignments	40%
Test	20%
	100%

Class Participation

Students will be assigned required readings before class and discussions will include questions on essential content. The class participation grade will be based on the student's preparedness for these discussions.

Homework Policy and Expectations

Each student is responsible for turning in their homework and laboratory results. You may consult other students for assistance. Do not copy other student's work.

In your homework requiring calculations, submit in a spreadsheet file, please show all the key steps and calculations in your analysis.

Please email a copy of your homework before class on the day the assignment is due.

Class Schedule

Jan 11 – Lecture: Introduction

Jan 18 – Lecture: EPA and other Agency Websites, Manufacturer Websites: Documents, and other useful information; Laboratory: Orientation to Lab

Jan 25 – Lecture: Nitrogen Oxides Monitoring methods; Lab: Instrument orientation and calibration

Feb 1 – Lecture: Nitrogen Oxides Monitoring methods; Lab: Instrument orientation and calibration; comparison of calibration methods

Feb 8 – Lecture: Ozone Monitoring methods; Lab: Instrument orientation

Feb 15 – Lecture: Ozone Monitoring methods; Lab: Instrument orientation: measurement of unknown

Feb 22 – Lecture: Interferences for Ozone and Nitrogen Oxides; Lab: Interference testing

Feb 29 – Lecture: Review of Lab Analyses and estimate of measurement uncertainty; Lab: First full chamber experiment for producing ozone

Mar 7 – Lecture: Gas Chromatography; Lab: Orientation with instruments

Mar 14 – Lecture: Gas Chromatography; Lab: Calibration and identification of unknowns

Mar 21 – Lecture: Other Detectors for Gas Chromatography; Lab: Calibration and Second Chamber experiment with both NOx and mixtures of hydrocarbons

Mar 28 – Lecture: Mass Spectrometry; Lab: Orientation with instruments

Apr 4 – Lecture: Mass Spectrometry; Lab: Calibration and identification of unknowns in Third Chamber experiment

Apr 11 – Lecture: Derivatization methods; Lab measurement of “carbonyls”

Apr 18 – Lecture: Field sampling methods; Lab: evaluation for recovery efficiency

Apr 25 – Lecture: Coordinating operation of multiple methods; Lab: Last Chamber Experiment