CE 409 -- Air Quality Modeling

2007 Catalog Data: 409 Air Quality Modeling 3 Prereq one semester calculus and physics. Theory and practice of air quality modeling with an emphasis on principles of atmospheric pollutant dispersion and regulatory air quality models.

Text and references: Fundamentals of Stack Gas Dispersion, M.R. Beychok, 3rd Ed., 1994. Reading and reference materials will be provided as handouts.

Goal: To introduce fundamental concepts of pollutant dispersion in the atmospheric boundary layer, to learn basic Gaussian plume and puff dispersion modeling methods, and to develop the ability to use current EPA regulatory models and methods to design solutions to a range of air quality problems.

Approach: The class will focus on matching theoretical methods with physical dispersion concepts to show how pollutant dispersion can be treated quantitatively. Homework will involve problem solving, application of modeling methods, and description of physical concepts. Class projects will emphasize collection of meteorological and dispersion data and use of regulatory computer models to develop solutions to current air quality problems.

Week	Topics
Aug 22	Clean air act, modeling needs & requirements
Aug 29	Boundary layer meteorology
Sept 5	Pbl concepts
Sept 12	Turbulence and stability
Sept 19	Exam I
Sept 26	Gaussian plume concepts
Oct 3	Plume rise and related Gaussian plume calculations
Oct 10	Gaussian plume modeling for complex source types
Oct 17	Gaussian puff modeling methods
Oct 24	Exam II
Oct 31	EPA regulatory models
Nov 7	Introduction to ISC-Aermod
Nov 14	ISC-Aermod cont.
Nov 21	Thanksgiving week
Nov 28	ISC-Aermod project
Dec 5	ISC-Aermod project
Dec 12	Finals week

Course Outcomes:
This course contributes towards the following the educational outcomes set forth by the CEE department.

Outcome	Role of CE 409
Outcome 4 – the ability to think logically, critically and creatively.	This class includes at least one major modeling project in which a state-of-the-art model is used to estimate pollutant levels for a specific industrial source. For each project there is no single correct analysis. Students must learn how to check their own work for reasonableness.
Outcome 7 – ability to use modern techniques, including computer applicationsi	The students use commercial air quality modeling codes as part of the team modeling projects. Learning to use these tools is a key part of the project and the course.
Outcome 9 – the ability to communicate effectively in written, oral and graphical forms.	The modeling project assignments include a written report that is graded not only on the basis of the engineering calculations but also on the quality of the writing. The report is expected to be clear and concise.
Outcome 10 – broad educational experiences that provide an awareness and understanding of the impact of engineering on global and society issues.	Students learn about the nature of contemporary air quality issues, including causes, sources, and effects. Students are taught that air pollution problems range from local to regional to global in scale. They learn that mobile sources comprise a very significant source of air pollutant emissions not only in the US but also worldwide.

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