Title: Environmental Modeling and Health Risk Analysis (CEE 4340)

1. **Course Description:** Environmental Health means different things to different people. This course provides an introduction to modeling techniques used in the environmental health field, with emphasis on three different exposure pathways that are introduced as the air pathway, groundwater pathway and the surface water pathway. The subject is introduced through practical examples from the fields of environmental exposure analysis and health risk evaluation. Students will get familiar with these concepts and definitions used in these seemingly two distant fields through the understanding of the language and definitions used in each field. The course concludes with discussions on the ethics and the future of our increasing environmental health knowledge. A software tool is also introduced that is used in this analysis. The software ACTS/RISK was developed at Georgia Tech and used by agencies such as the Centers for Disease Control and Prevention and U.S. EPA.
2. **Course Objectives:** The objective is to understand the relevance of increasing investments of our society in environmental health field and its consequences in our everyday life. The focus is more towards the practical applications of environmental modeling as opposed to the detailed understanding of the underlying technologies. Therefore, the course is expected to be useful for students following a career in the environmental modeling field and/or in environmental health risk assessment and consulting.
3. **Course Structure:** The course consists primarily of lectures followed by demonstrations, which are based on recent literature and technological innovations. Students are required to work individually on a site specific application that will be their semester project. The semester project will be submitted at the end of the semester and in class presentations of the findings of their study will be done if time permits. Given time limitations, a selected few presentations may be included in this phase on a voluntary basis or by the selection of the instructor.
4. **Instructors:** Dr. Mustafa M. Aral Dr. Ted Russell

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1. **Office Hours:** Open door policy by the instructors, appointments can be made if needed.
2. **Prerequisites:** CEE 2300 Environmental Engineering Principles. CEE 3040 Fluid Mechanics.
3. **Evaluation (grading):**

Class participation: 5%

Exams (mid-term and final): 60%

Homeworks: 5%

Project and presentation: 30%

1. **Policies:** All students are expected to comply with the Georgia Tech Honor Code. Any evidence of cheating or other violations will be referred to the Dean of Students with a recommendation that the penalty be an award of zero points for the graded requirement, and a one letter grade reduction in the course. Cheating includes, but is not limited to: using unauthorized references or notes; copying directly from any source- including friends, classmates, or tutors; allowing another person to copy your work; taking an exam or handing in a graded requirement in someone else’s name, or having someone else take an exam or hand in a graded requirement in your name; or asking for a re-grade of a paper that has been altered from its original form.
2. **Textbook:** Environmental Modeling and Health Risk Analysis (2010) p.470; ISBN 978-90-481-8607-5; New York, London, Heidelberg; Springer publishers. Author: Mustafa M. Aral, All chapters of this reference book will be covered.
3. **Lectures per week:**
4. What is modeling and basic principles that govern environmental modeling. Concepts and definition that link environmental problems and health issues in human and ecological systems.
5. What is health sciences and its relation to environmental sciences. What is exposure, exposure dose and health risk.
6. Mathematical methods and definitions governing the environmental health modeling field.
7. Introduction of the mathematical models necessary to analyze environmental and health risk applications in three environmental pathways (air, groundwater, surface water).
8. Introduction of the mathematical models necessary to analyze environmental and health risk applications in health risk applications.
9. Introduction of the ACTS/RISK computational platform to be used as supplemental application platform in the class.
10. Air Pathway Analysis.
11. Air Pathway Analysis and examples.
12. **Midterm exam**.
13. Groundwater Pathway Analysis.
14. Spring break.
15. Groundwater Pathway Analysis and examples.
16. Surface Water Pathway Analysis.
17. Surface Water Pathway Analysis and examples.
18. Statistical methods used in Health Risk evaluation.
19. Health Risk analysis and examples.
20. **Final Exam**.
21. **Earlier course offering:** The proposed course has been offered during the past four years under the title Hazardous Substance Engineering (CEE 4320), which is not very descriptive of the topics covered in the course. The discussion within the ENVE group led to the conclusion that the course should have its own title and course number. During the past four years the attendance to the course was 16 (2010 Fall), 20 (2011 Fall), 25 (2012 Fall) and 30 (2013 Fall) students.