CE 597C Surface Water Quality Modeling

T,Th 9:45-11:00 AM in 212 Hammond

INSTRUCTOR: Dr. Michael Gooseff
OFFICE: 231 P Sackett Building
TELEPHONE: 867-0044
EMAIL: mgooseff@engr.psu.edu
OFFICE HOURS: Tuesdays 3-5 PM and Fridays 9-11 AM, or by appointment

REQUIRED TEXT: Chapra, S.C., 1997. Surface Water-Quality Modeling, McGraw-Hill, New York, NY., pp. 844.

GRADING:	Homework	35%
	Projects	35%
	Quizzes	30%

Final grades will be based on the weighted-average specified above and assigned as follows:

- A = 94-100%
- A- = 90-93%
- B+ = 87-89%
- B = 84-86%
- B- = 80-83%
- C+ = 76-79%
- C = 70-75%
- D = 60-69%
- F < 60%

I reserve the right to adjust your grades. Your grade will only improve if adjustments are necessary. Feel free to contact me during office hours or by appointment if you have grade-related questions or concerns.

COURSE GOALS:
Enable you to apply the fundamental principles of behind numerical simulations of biological, chemical, and physical processes in surface water systems. You will use three common models available for free on the internet:
1) QUAL-2K (created and maintained by the US EPA),
2) SNTEMP (created and maintained by the US Geological Survey), and
3) WASP (created by the US EPA).

HOMEWORK:
Homework will be assigned weekly and is due at the **beginning of class** on the subsequent week (generally 1 week later). Late homework **will not** be accepted. Please present your work in an organized, clear fashion.

PROJECTS:
During the semester, you will be generating your own numerical surface water quality model, and you will then apply that model to any case of your choice. You can use any coding language (I strongly encourage you to use MATLAB) you choose. In homework assignments and quizzes, you will use pseudocode to develop the algorithms for your model. You will work by yourself on this project and generate 2 products: 1) a report of your activity to be 'turned in' as a web page (rather than a hard copy report to hand in) and 2) an oral presentation of your project. You will essentially perform simulations of changes to water quality of a particular real-world system. The choice of system, water quality parameter, and model is yours. To help you make progress on this report, you will turn in the following items along the way:

1) Project Proposal – due Th. Sep. 11, a 1 page proposal defining the problem, location, data needs, and model you intend to use. I'll grade these and get them back to you with feedback about either reigning you in or pushing you a little further on one aspect or another.
2) Project Update #1 – due Th. Oct. 9, a 1 page narrative of the progress on your proposal. I would expect that by this point you would have identified data available, etc. Please summarize how the pieces are coming together.
3) Project Update #2 – due Th. Nov. 13 online; send me a link to a preliminary version of your project web page with summary information and status.

QUIZZES:

Your performance in this class will also be evaluated by bi-weekly quizzes. The quizzes will be ~25 minutes long and will likely have a mix of short answer, multiple choice, and numerical problems to solve.

ACADEMIC INTEGRITY

The University's statement on academic integrity, from which the following statement is drawn, is available at **http://www.psu.edu/dept/oue/aappm/G-9.html**

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. All students are expected to act with civility, personal integrity; respect other students' dignity, rights and property; and help create and maintain an environment in which all can succeed through the fruits of their own efforts. An environment of academic integrity is requisite to respect for self and others and a civil community. Academic integrity includes a commitment to not engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty include cheating or copying, plagiarizing, submitting another persons' work as one's own, using Internet sources without citation, fabricating field data or citations, "ghosting" (taking or having another student take an exam), stealing examinations, tampering with the academic work of another student, facilitating other students' acts of academic dishonesty, etc. Students charged with a breach of academic integrity will receive due process and, if the charge is found valid, academic sanctions may range, depending on the severity of the offense, from F for the assignment to F for the course.

COURSE SCHEDULE (subject to change, if topics require more lecture time)

NOTE that Readings are FOR that particular lecture, e.g., for Lecture #4, you should read L. 4 to be prepared for class.

Lec. #	*Week/Date*	*Topic*	*Reading*	*Assignments/Quiz*
1	1T – Aug. 26	Introduction/Class Business	None	
2	1Th – Aug. 28	Reaction Kinetics	L 1, 2	
3	2T – Sep. 2	Mass Balance, CSTR Steady-State Solution, Response Time	L 3	
4	2Th – Sep. 4	Particular Solutions	L 4	Homework #1 due
5	3T – Sep. 9	Feedforward/Feedback Systems of Reactors	L 5, 6	
6	3Th – Sep. 11	Numerical Methods for Well-Mixed Reactors	L 7	Quiz #1, *Project Proposal*
7	4W – Sep. 16	Diffusion	L 8	
8	4F – Sep. 18	Distributed Systems	L 9, 10	Homework #2 due
9	5T – Sep. 23	Numerical Methods for Control-Volume Approach	L 11, 12	
10	5Th – Sep. 25	Advanced Methods, Rivers and Streams	L 13, 14	Quiz #2
11	6T – Sep. 30	The Modeling Environment	L 18	
12	6Th – Oct. 2	BOD and Oxygen Saturation, Gas Transfer	L 19, 20	Homework #3 due
13	7T – Oct. 7	Point Source Models (Streeter-Phelps) **special guest lecture by M. Doyle**	L 21	
14	7Th – Oct. 9	Distributed Source Models	L 22	Quiz #3 Project Update #1
15	8T – Oct. 14	Nitrogen	L 23	
16	8Th – Oct. 16	Photosynthesis	L 24	Homework #4 due
17	9T – Oct. 21	Sediment Oxygen Demand	L 25	
18	9Th – Oct. 23	QUAL2E/K model	L 26	Quiz #4
26	10T – Oct. 28	Self-Learning – WASP7 model		
27	10Th – Oct. 30	Self-Learning – WASP7 model		Homework #5 due
29	11T – Nov. 4	Pathogens	L 27, 28	
30	11Th – Nov. 6	Eutrophication, Phosphorous, Communities	L 29	Quiz #5 Project Update #2
32	12T – Nov. 11	Heat Budgets & SNTEMP model	L 30	
33	12Th – Nov. 13	Microbe/Substrate Modeling and Plant Growth & Nonpredatory Losses	L 32, 33	Homework #6 due
35	13T – Nov. 18	Predator-Prey and Nutrient/Food-Chain Interactions	L 34	
36	13Th – Nov. 20	Nutrient/Food-Chain Modeling	L 35	Quiz #6
No Classes – Fall Break				
38	14T – Dec. 2	Toxic Substance Modeling	L 40, 41	
39	14Th – Dec. 4	Reaction Mechanisms: Photolysis, Hydrolysis & Biodegradation	L 42	Homework #7 due
41	15T – Dec. 9	Radionuclides and Metals	L 43	
42	15Th – Dec. 11	Project Report Presentations		Quiz #7