ENE801: Dynamics of Environmental Systems
Spring 2015

Time: 10:20 - 11:10 Monday, Wednesday and Friday
Location: 1300 Engineering Building
Instructor: A Anctil / P Mantha
Assistant Professor, Civil & Environmental Engineering
1449 Engineering Research Complex - A132
E-mail: anctilan@egr.msu.edu
Phone: (517) 432-4692
Office hours: Wednesday 1:30- 3:00 pm EB3575 or by appointment

Course Description
The objective of this course is to understand the principles of mass balance, reaction kinetics and reactor theory as applied to environmental science and engineering. We will develop the expertise to model environmental systems and to solve systems of differential equations that often arise from the application of the above principles. Our approach is to understand the physical and chemical principles first and then translate that understanding into the language of mathematics and into working models. Students are expected to have a good background in mathematics (including calculus, differential equations and linear algebra) and computers.

Textbook
Surface Water Quality Modeling by Steven C. Chapra. Publisher Waveland Press, Long Grove, IL (2008) ISBN: 1577666054

Assessment Criteria

1.	Homework (approximately 10)	40%
2.	Midterm	25%
3.	Final	30%
4.	Attendance and participation	5%

Homework will be assigned regularly throughout the semester on Friday and due the following Friday. Homework must contain the following information on the first page and preferably on every page: Student name, ID number, course number and the problem set number. Submit only high-quality illustrations. If your homework involves writing a computer program (e.g. a Matlab script) make sure that you submit the source code of the program as well. It is fine to discuss homework but your homework should be uniquely yours. Late homework will receive an automatic 10% deduction for every day overdue, starting at the time of class.

Grading Scale:

> 90	4.0
85-90	3.5
80-85	3.0
75-80	2.5
70-75	2.0
65-70	1.5
< 65	1.0

Policy
- Attendance at regular scheduled class meetings is expected as well as participation in class discussions.
- In the event of an unplanned absence by the professor, class will be cancelled after 15 minutes
- Academic honesty is expected. Any violation of Michigan State University policy as described in the Student Handbook will not be tolerated and may result in a failing grade. For additional information visit the web page of the office of the ombudsman at MSU: http://www.msu.edu/unit/ombud/

Tentative Course Outline (Subject to Change)

Day	Topic	Reading Assignment & Remarks
Jan 12	Introduction	
Jan 14	Introduction to Matlab (P. Mantha)	
Jan16	Matlab	
Jan 19	NO CLASS (ML King)	
Jan 21	Matlab	EB lab 2314
Jan 23	Matlab	EB lab 2314
Jan 26	Reaction Kinetics	Ch.2
Jan 28	Simple water quality models	Ch. 3
Jan 30	Particular solutions	Ch. 4
Feb 2	Work Problems	
Feb 4	Feed forward	Ch. 5
Feb 6	Feedback system	Ch. 6
Feb 9	Diffusion	Ch 8
Feb11	Distributed systems – steady state	Ch 9
Feb 13	Distributed systems – time	Ch 10
Feb 16	Work problems	
Feb 18	Mid-term	
Feb 20	Control Volume Analysis - Steady state	Ch11
Feb 23	Control Volume Analysis - Time	Ch. 12 & 13
Feb 25	Work Problems	
Feb 27	River and Streams - 1	Ch. 14
Mar 2	River and Streams - 2	
Mar 4	Estuaries	Ch. 15
Mar 6	Work Problems	
Mar 9 -13	*Spring Break*	
Mar 16	Lakes and Impoundments	Ch. 16
Mar 18	Sediments	Ch. 17
Mar 20	BOD & Oxygen Saturation	Ch. 19
Mar 23	Gas Transfer & Oxygen Reaeration	Ch. 20
Mar 25	Work Problems	
Mar 27	Streeter - Phelps Equation	Ch. 21 & 22
Mar 30	Uncertainty Analysis	Ch. 18
Apr 1	Modeling Microbial Processes	Ch. 32
Apr 3	Modeling Pathogen Transport	Ch. 27
Apr 6	Nutrients and Eutrophication	Ch. 28
Apr 8	Work Problems	
Apr 10	Photosynthesis & Respiration	Ch. 24
Apr13	Modeling Plant Growth	Ch. 33
Apr 15	Modeling Temperature	Ch. 30
Apr 17	Modeling Sorption	Ch. 41
Apr 20	Work Problems	
Apr 22	Additional Topics	
Apr 24	Additional Topics	
Apr 27	Additional Topics	
Apr 29	Review final exam	
May 1	Final exam take home available	
May 4-May 8	Finals week Exam Week Take home	