ENV 5666-U01 (18609) WATER QUALITY MANAGEMENT
Prerequisites: Permission of the Instructor
Department of Civil and Environmental Engineering
Florida International University
Spring 2021

Instructor: Professor Fuentes, Ph.D., P.E., B.C.E.E.
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Home Page: http://myweb.fiu.edu/fuentes/ - Course Website: http://web.eng.fiu.edu/fuentes/
Office Hours: T: 10:30AM-1:30PM
First-come/first-served policy during office hours ((first-come, first-served; preferred via phone or Zoom).
All other office hours by appointment.

Lecture location and time: EC 2420 & W: 5:00-7:40. *Students must be fully aware that Professor Fuentes's "in-person" mode of delivery of his course lectures may be changed temporarily to "remote", via ZOOM (or equivalent), depending upon University instructions that can be announced at any time during the course program; if possible, officially scheduled lectures time will not be changed.*

COVID 19 Health & Safety: Please continue to adhere to mitigation measures to stop the spread of the coronavirus, including physical distancing guidelines, washing your hands with soap and water or using hand sanitizer, and wearing a face covering to protect yourself and those around you. Please note that FIU requires students, faculty and staff to check in on the *FIU P3 app* before the beginning of each day on campus. The app is available from the Google Play or Apple store. If you have any questions about the FIU P3 app or the campus visitor protocols, please email FIUP3support@fiu.edu.

For updated information on FIU's response to the COVID-19 pandemic, please visit FIU's Panthers Protecting Panthers website. For information, including guidelines, from the federal *Center for Disease Control & Prevention*, you may link to Coronavirus Disease 2019 (COVID-19) | CDC .

A. Course Description & Objective

The quality of our water resources is vital to the health and welfare of each human and community in the planet. Their protection requires understanding of the laws, principles, and methods to develop mathematical models for simulation of the flow and transport of effect of contaminants in surface water bodies. The *learning objective* of the course is to provide civil engineering and environmental engineering graduate students with a working knowledge of the fundamental role that physical, chemical and biological processes play in deriving mathematical models that simulate the flow, fate and transport of contaminants in surface waters.

Course contents will then focus on a sequence of surface water quality modeling themes as follows: a) completely mixed and incompletely mixed systems and b) applications to lakes, rivers and streams, estuaries, and lakes. Examples of relevant questions are: How does concentration change along an inter-tidal river after a spill of a hazardous compound? What are the governing equations to effectively simulate the transport of arsenic through a system of interconnected lakes?

B. Textbook & Study Material

Required textbook/material:

1. *Chapra, S. C., "Surface Water-Quality Modeling,"* Waveland Press (re-issued 2008), ISBN 1-57766-605-4, Long Grove, Illinois.

2. Selected Reference Handouts (students must make their own copies from library reserves).

Although the text will assist you well during the course, you are expected to supplement its contents with class notes, handouts and recommended references. Each student is responsible for the timely study of assigned material. Careful study of theory and examples and solving problems are crucial in mastering the learning objective.

C. Use & Management of Class Time

Class time is used to present and discuss theory and applications. Lectures will follow the sequence of topics, as listed below. Lectures will focus on basic concepts and representative methodologies, with an analysis of applications.

Theme	**Topic (Study Assignment)**	**Estimate of Lectures**
Part I – Completely Mixed Systems		
1.	Introduction: 1.1 to 1.5, Appendices	1.5
2.	Reaction Kinetics: 2.1 to 2.4	1.5
3.	Steady State: 3.1 to 3.3	1.5
4.	Particular Solutions: 4.1 to 4.7	1.5
5.	Feedforward Systems: 5.1 to 5.3	1.5
6.	Feedback Systems: 6.1 to 6.5	1.5
7.	Computer methods: 7.1 to 7.4	2
Part II – Incompletely Mixed Systems		
8.	Diffusion: 8.1 to 8.5	1
9.	Distributed Systems (Steady State): 9.1 to 9.3	2.0
10.	Distributed Systems (Time Variable): 10.1 to 10.5	1.5
11.	Control-volume Approach: Steady State: 11.1 to 11.8	1.5
12.	Control-volume Approach: Time Variable: 12.1 to 12.4	1.0
Part III – Aquatic Environments		
13.	River Systems: 14.1 to 14.6	1
14.	Estuaries: 15.1 to 15.4	1
15.	Sediments: 17.1 to17.6	1

16.	The Modeling Environment: 18.1 to 18.4	1

Part IV – Applications to Selected Indicators (advanced)

17.	Streeter-Phelps: Point Sources: 21.1 to 21.6	1
18.	Streeter-Phelps: Distributed Sources: 22.1 to 22.3	1
19.	QUAL2E Model: 26.1, 26.2	1

Parts III, IV, V, VI or other priority topics – *Graduate Student* Presentations (to-be-assigned)

D. Grading Policies

Homework	15%
Exam 1	25%
Exam 2	25%
Graduate Student Presentations (assigned by instructor)	5%
Project	30% (proposal due on February 24; written report due on 04/20/21; and oral presentation on 04/23/21)
Total Maximum	100

The instructor will assign problems as homework, so that students practice the application of concepts in problem solving while preparing exams. Homework is strictly due on the scheduled day at the beginning of the class. Late homework will not be accepted, receiving zero points. Homework will follow the requested format and must be presented in engineering paper. Students are responsible for timely discussing their homework approach and solutions with the instructor, during his scheduled office hours, in advance to the due day.

Questions and problems in exams will focus on assigned and covered material and related applications. Homework grading and return timing does not condition any exam content. Exams 1 and 2 will be respectively held on February 17 (No. 1) and March 17 (No. 2). Both exams will be held during most of the second lecture time on the scheduled days.

The instructor will assign each student a section from the textbook for the student to prepare and make a short presentation (i.e., 10 to 15 minutes) in MSPowerPoint to the class. Covered material should address, at much as possible, purpose and importance, theory, concept(s), description, applications and research needs. Maximum grade is 5 points, equally based on organization and quality of delivery.

One student or teams of up to 2 students will complete an engineering project (See addendum on “engineering project guidelines”). A one-page proposal, per guidelines, should be presented not later than February 24. The written project report is due on April 20. The oral presentation of the project will be held on April 23. The instructor may later announce other criteria either for homework, exams or presentations.

***ADVICE*: ANY QUESTIONS ABOUT GRADES WILL ONLY BE CONSIDERED WITHIN THE FIVE WORKING DAYS FOLLOWING THEIR ANNOUNCEMENT.**

Final grade is a function of the total number of points accumulated by the student at the end of the course, as follows:

93.3	≤ A	≤ 100.0	76.7	≤ C+	< 80.0
90.0	≤ A-	< 93.3	70.0	≤ C	< 76.7
86.7	≤ B+	< 90.0	60.0	≤ D	< 70.0.
83.3	≤ B	< 86.7		F	< 60.0
80.0	≤ B-	< 83.3			

E. Other Performance Policies

Reading assignments, a prime student's responsibility, must be completed prior to scheduled classes. Class attendance is required. A student with three unjustified absences will be dropped from the course with a DR on March 22. Students will automatically lose 0.45 points per unjustified absence after March 22, including those prior to March 22. No make-ups or incomplete grades will be considered, unless justified and documented.

F. Days to Remember (refer for confirmation to the FIU Fall 2020-2021 Semester Calendar and Deadlines)

http://catalog.fiu.edu/2020_2021/graduate/Admission_and_Registration_Information/GD_Academic_Calendar.pdf

January 11	Classes begin (Presentation assignments)
January 18:	Martin Luther king Day (University Closed)
February 24:	Project Proposal
March 22:	Deadline to drop a course with a DR grade. Last day to withdraw from the University with a WI grade.
April 17:	Classes end
April 20:	Engineering Project: Written Report Due
April 23:	Engineering Project: Oral Presentation
April 19-24	Final Week
April 28	Deadline (by 11:59) for faculty to submit grades

The instructor will comply and enforce all applicable FIU's Policies and Regulations. It is the students' responsibility to know all applicable policies and requirements. All students should refer, for details, to the *FIU Student Handbook* (which includes the Student Code of Conduct) at https://studentaffairs.fiu.edu/about/student-handbook/index.php

All students are deemed by the university to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the FIU Student Handbook. Misconduct includes, among other, *cheating, plagiarism, misrepresentation misuse of computer services, bribery, conspiracy and collusion, falsification of records and academic dishonesty* (please visit http://integrity.fiu.edu).

Students should be aware of both Panthers Care and CAPS services for students, which support their well-being.

G. Some Recommended References

The following books, for your consideration and use, may be checked out from the instructor, during his scheduled office hours, for up to 48 hours.

Water-Quality Engineering in Natural Systems, D. A. Chin, Wiley, 2013.

Environmental Systems Engineering, L. G. Rich, McGraw-Hill, 1973.

Aquatic Chemistry, W. Stumm and J. J. Morgan, John Wiley & Sons, Inc., 1996.

Principles of Surface Water Quality Modeling and Control, R. V. Thomann and J. A. Mueller, Harper & Row Publishers, New York, NY, 1987 (2).

www.epa.gov www.usgs.gov

www.nws.noaa.gov www.nrcs.usda.gov

www.dep.state.fl.us/water