

**CWR 5535C U01 (18434):**  
**Advanced Modeling Applications in Water Resources Engineering**  
**Prerequisites: Permission by Instructor**  
**Department of Civil and Environmental Engineering1**  
**Florida International University**  
Spring 2024

**Instructor:** Professor Fuentes, Ph.D., P.E., B.C.E.E.

Office: EC-3671; Mailbox: EC-3680

Phone No.: 305 348-2837, E-mail: [fuentes@fiu.edu](mailto:fuentes@fiu.edu)

Home Page: <http://myweb.fiu.edu/fuentes/> Course Website: <http://web.eng.fiu.edu/fuentes/>

Office Hours: M, W: 10:30AM-12:00PM (first-come, first-served; preferred via phone or Zoom).

All other office hours by appointment.

**Lecture location and time:** EC-2830; Wednesdays: 4:00-6:40 PM. Delivery: *In-person*

### **A. Course Description & Objective**

Models are crucial tools that are used by engineers in support of analysis, design, operation and maintenance of water systems. Those systems are part of water infrastructure that is in urban or non-urban settings. Systems include those related to water supply (e.g., uptake, conveyance, storage and distribution) and wastewater and stormwater (e.g., collection, conveyance, storage, treatment and discharge). The overall goal of this course is to provide civil engineering and environmental engineering graduate students with a concerted opportunity to identify, assess, study, implement and use computer models in support of their engineering practice or research and development or both. Model applications in an approach that assesses technical and cost scenarios (i.e., alternatives). Students, working individually or in teams, will first study and apply several models to solve hydrologic and hydraulic problems. Second, all students will, individually or in group, upon instructor's approval, will complete a full model application to a water system of their choice.

### **B. Textbook & Supplementary Material**

Required text, reference material and computer access:

1. Whitman, B. E. and T. M. Walski (2021), *Computer Applications in Hydraulic Engineering*, 9<sup>th</sup> Edition, Bentley Institute Press, ISBN-10: 1934493708 and ISBN-13: 978-1934493700. Your purchased copy includes a procedure to download the latest software from the Bentley website. Be very aware that the **software should only be used for academic purposes; any other use, including personal or commercial, is prohibited.** In consultation with the instructor, the student(s) may also consider other reference materials and software, in support of their course modeling experiences.
2. [www.bentley.com](http://www.bentley.com) and supplementary downloadable material.
3. Each student must have access to a computer to access software.

### **C. Use & Management of Class Time**

Class time is used in two ways: a) organizational activities; b) presentation and discussion of hydrologic

*Version 01/16/24 - Final*

and hydraulic concepts, theory and models; c) e-training and reports; and d) completion of full model application.

<b><u>Activity</u></b>	<b><u>Topic (Study Assignment)</u></b>	<b><u>Estimated No. of Lectures</u></b>
1.	Organization and Introduction	2 (January 10)
2.	Hydrology Review: Ch. 2 & Probability Software*	2 (January 17)
3.	Hydraulic Principles & FlowMaster*: Ch. 1	2 (January 24)
4.	Culvert Hydraulics & CulvertMaster*: Ch. 4	2 (January 31)
5.	Inlets, Gravity Piping Systems, and Storm Sewer Systems & StormCAD*: Ch. 3	2 (February 7, 14)
6.	Detention Pond Design & PondPack*: Ch. 5	2 (February 14, 21)
7.	e-Training (i.e., on-demand courses, etc.)	2 (February 21)
8.	e-Training (i.e., on-demand courses, etc.)	2 (February 28)
9.	e-Training (i.e., on-demand courses, etc.)	2 (March 6)
10.	Full Model Application Progress Report: (Theory, Model and System Description	2 (March 13)
11.	Modeling Work Period	2 (March 14 – April 10)
12.	Full Model Application: Written Report Due	2 (April 17)
13.	Full Model Application: Oral Presentation	2 (April 24)

\* Presentations by Responsible Student & Class Discussion

#### **D. Application Case(s)**

The Full Model Application is accomplished individually. Students should select one model amongst the following: WaterGEMS, SewerGEMS, HAMMER and CivilStorm, and SWMM. Other models, from Bentley Systems, Inc., may also be considered in consultation with the instructor. *Student is expected to conduct a literature review identifying relevant references, in support of the water system of their application; emphasis should be scientific and engineering journal articles. Examples of systems include those for water supply distribution, municipal wastewater and stormwater collection and conveyance, among others.*

#### **E. Grading Policies**

Basic Hydrology (Quiz)	5
Basic Hydraulic Principles & <i>FlowMaster</i>	10*
Inlets, Gravity Piping Systems, and Storm Sewer Systems & <i>StormCAD</i>	10*
Culvert Hydraulics & <i>CulvertMaster</i>	10*
Detention Pond Design & <i>PondPack</i>	10*
e-Training (minimum <u>20</u> hours in official Bentley transcript)	15
Full Model Application: Progress Report (March 13)	0
Full Model Application: Written Report (April 17)	25
Full Model Application: Oral Presentation (April 24)	15

*Version 01/16/24 - Final*

Total Maximum

100

*\*The student will study and learn each model (i.e., software package) to then demonstrate the ability to solve assigned problem(s). The student will make a presentation to explain the mode and the solutions to the problem(s). The solutions are submitted as a hard copy of both the printouts of the input data and results sheets, highlighting all answers to all questions. Printouts, including tables and graphs, are commonly generated by the software, upon your command.*

The *Full Model Application Progress Report* of March 13 should be a 15-min oral presentation in MS Power Point, with 10 to 15 slides. For details on the Application Case Written Report and Oral Presentation, refer to the attached *Application Case Addendum*. The instructor may provide additional information.

*The student is expected to open needed personal accounts to access the updated Bentley software directly or indirectly at the EC computer Labs where the software has been uploaded (EC 2830, EC 2840 and EC 2807 (onsite or remotely) and EC 2400, EC 2410, EC 2420, EC 2440 and EC 2330. When you purchase the 9<sup>th</sup> edition of CAiHE (the textbook) you will also be provided with an additional option to your personal access to the software.*

**ADVICE: ANY QUESTIONS OR CONCERNS ON GRADES WILL ONLY BE CONSIDERED WITHIN THE FIVE WORKING DAYS FOLLOWING THEIR OFFICIAL 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	70.0 ≤ C	< 76.7
90.0 ≤ A-	< 93.3	60.0 ≤ D	< 70.0
86.7 ≤ B+	< 90.0	F	< 60.0
83.3 ≤ B	< 86.7		
80.0 ≤ B-	< 83.3		
76.7 ≤ C+	< 80.0		

**F. Days to Remember (refer for confirmation to the FIU Fall 2023-2024 Semester Calendar and Deadlines)**

[GD\\_Academic\\_Calendar.pdf \(fiu.edu\)](#)

January 8:	Classes begin (Presentation assignments)
January 15:	Martin Luther King Day (University Closed)
Feb 26–March 2:	Spring Break (University open; no classes)
March 18:	Deadline to drop a course with a DR grade. Last day to withdraw from the University with a WI grade.
March 13:	Full Model Application: Progress Report

*Version 01/16/24 - Final*

April 20:	Classes end
April 22:	Full Model Application: Written Report Due
April 24:	Full Model Application: Oral Presentation (5:00-7:40PM ???)
April 22-27:	Final Week
May 1:	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 [FIU Student Handbook 2023-2024](#)

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 use the following link for details:

[Student Conduct and Academic Integrity | Division of Academic & Student Affairs | Florida International University \(fiu.edu\)](#)

Students should also be aware of both [Panthers Care](#) and [CAPS](#) services for students, which support their well-being.

#### **H. Some Recommended References**

*A good number of relevant references, for your consideration and use, are available at the main library. In addition, the items below may be checked out from the instructor for up to 48 hours:*

Chow, V. T., Open Channel Hydraulics, McGraw-Hill Book Company, 1988.  
 Gupta, R. S., Hydrology & Hydraulic Systems, Waveland Press, Inc., 2017  
 Mays, L. W., Water Resources Engineering, John Wiley & Sons, Inc. 2011.  
 Wurbs, R. A. and W. P. James, Water Resources Engineering, Prentice Hall, Inc. 2002.  
[www.bentley.com](http://www.bentley.com), [www.usace.army.mil](http://www.usace.army.mil), [www.usbr.gov](http://www.usbr.gov)  
[www.usda.gov](http://www.usda.gov), [www.usgs.gov](http://www.usgs.gov), [www.nws.noaa.gov](http://www.nws.noaa.gov)