

CE 378 Water Resources Engineering

Term: Spring 08

CE 378 Water Resources Engineering (4). Four hours, including laboratory
1:00 to 1:50 M, W and F, room 342 H.M. Comer

Instructor: Robert E. Pitt
Lab instructor and grader: Humberto Avila

Office: 347 MIB
Office Hours: M and W 2:30 to 3:30, when in
town, or by appointment; by
email anytime

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Catalog Description	Mechanics of steady and unsteady flow in closed and open conduits, hydrology; water supply and wastewater disposal.
Prerequisites	Dynamics (AEM 264) and Fluid Mechanics (AEM 311).
Co requisites	none
Course Objectives	<p>This course is directed to applications of fluid mechanics, hydrology, and hydraulics as they apply to the discipline of water resources engineering. Topics covered include flow in closed conduits and open channels, hydraulic machinery (pumps), and surface water hydrology and statistical methods. Student projects will be directed to simple designs of urban water-use and water-control systems.</p> <p>At the successful completion of this course, the student will be able to apply the fundamental principles of conservation of mass, momentum and energy to the practical solution of both analysis and design problems in closed and open conduit flows, and will understand the performance characteristics of pumps. The student will also be introduced to hydrology and to methods of quantification of hydrologic uncertainty.</p>
Course Website	Located at: http://unix.eng.ua.edu/~rpitt/Class/Water%20Resources%20Engineering/WREMainPage.htm
Required Texts and References	Chin, D.A., <i>Water Resources Engineering</i> (2nd edition), Prentice Hall. 2006. 962 pages. This is the basic class reference for the course, and will be supplemented with additional material on the course website, and other Internet-based references shown below.
Suggested Texts and References	<p>National Council of Examiners for Engineering and Surveying. <i>FE Supplied - Reference Handbook</i>. 8th edition. 2008. http://www.ncees.org/exams/study_materials/fe_handbook/index.php</p> <p>Walski, T.M., Chase, D.V., and D.A. Savic. <i>Water Distribution Modeling</i>. Haestad Press, Waterbury, CT. 2001. The advanced edition is available on-line at: http://www.haestad.com/library/books/awdm/online/wwhelp/wwhimpl/java/html/wwhelp.</p>

	<p>htm</p> <p>Durrans, S.R. <i>Stormwater Conveyance Modeling and Design</i>. Haestad Press, Waterbury, CT. 2003, 686 pages. This book is also available on-line at: http://www.haestad.com/library/books/scmd/stormwateronlinebook/javascript/wwhelp/whimpl/java/html/wwhelp.htm</p> <p>Software: EPANet 2.0 (US EPA) water distribution system design and analysis software (August 16, 2007 most recent version). http://www.epa.gov/ORD/NRMRL/wswrd/epanet.html</p> <p>WinTR-55 1.0.08 (USDA) hydrology software (January 1, 2005 most recent version). http://www.wsi.nrcs.usda.gov/products/W2Q/H&H/Tools_Models/WinTR55.html</p> <p>SWMM5.00.011 (US EPA) storm drainage and sanitary sewerage system design and analysis software (July 16, 2007 most recent version). http://www.epa.gov/ednrmrl/models/swmm/index.htm</p>										
Grading	<p>The final grade assigned for this course will be based on the following distribution, subject to slight modifications:</p> <table data-bbox="435 1037 1140 1205"> <tr> <td>Homework</td> <td>15 %</td> </tr> <tr> <td>Projects</td> <td>40 %</td> </tr> <tr> <td>Laboratory write-ups</td> <td>25 %</td> </tr> <tr> <td>Final project assignment</td> <td>20 %</td> </tr> <tr> <td>Class portfolio</td> <td>Not graded</td> </tr> </table> <p>If you complete an assignment as given, and it is correct and presented in a professional manner, you will have done what is expected and will receive an “above average” grade. You will receive an “excellent” grade only for work of an outstanding caliber.</p> <p>3 term projects will be due during the term: water supply system design sanitary sewer design storm sewer system design</p> <p>If any of the major assignments are not turned in, the student will receive an incomplete for the course.</p>	Homework	15 %	Projects	40 %	Laboratory write-ups	25 %	Final project assignment	20 %	Class portfolio	Not graded
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Attendance Policy	<p>Students are expected to attend all lectures. If an absence is unavoidable, the student should contact the instructor before the class meeting. Excessive unexcused absences may result in grade reductions. The student is expected to be in class and seated at the beginning of the course period.</p>										
Homework Policy	<p>Homework and project assignments will be due on the dates announced in class. Homework turned in up to 2 days late will be assessed an automatic penalty of 20 percent. Homework submitted more that 2 days late will not be accepted. Missed assignments or quizzes will not be able to be made up unless prior arrangements have been made with the</p>										

	instructor, or in the case of a documented emergency.
Exam/Quiz Policy	The exams will consist of take-home project assignments. Students will work individually, as they will have different design objectives and locations.
Other Course Policies	<p>Computer Use Requirement:</p> <p>This course has a "C" designation and hence will partially fulfill core curriculum requirements established by The University of Alabama. Water resources engineering is a field in which solutions to problems are very often multi-valued rather than singly-valued. For example, solutions can consist of an entire vector or matrix of values, or they can be x-y graphs showing the relationship between two variables. Computer software, and particularly spreadsheets such as Microsoft's Excel, is very well suited to developing tabular and graphical solutions to problems of the types encountered in this course. <u>Students are required to employ software in the completion of homework and design assignments.</u> Failure to do so on any particular assignment will result in an automatic 20 percent grade reduction for that assignment. Failure to use computers on a recurring basis will result in a non-passing grade for the course.</p> <p>All laboratory reports and design project assignments are required to be typed using a word processor, with extensive use of the "equation editor" and computer generated tables and graphs. Photographs from digital cameras, or scanned prints, may also be needed for some assignments. Scanned photos or field sheets should be saved as reduced size jpgs (200 dpi is suitable) to reduce the total file size of the resulting document.</p>
Course Portfolio	<p>The CEE program requires every student in every class to develop a course outcome portfolio. Through the course portfolio, each student is to demonstrate their achievement of the specific program outcomes addressed in each course (see the "Contribution to Program Student Outcomes" section of this syllabus). Graded work from the course (e.g., graded homework, projects, reports, quizzes, exams, etc.) may be used to illustrate achievement of the outcomes. Several assignments, projects, and/or quiz/exam questions in each course will address specific outcomes. If a student does well in these assignments, they would be suitable examples for inclusion in the final degree portfolio. The portfolios will be collected prior to or during the final exam. They will be returned upon grading of the final exam, and must be picked up by the students for possible future use in the final degree portfolio.</p> <p>The portfolio must be organized with tabs indicating each outcome separately (e.g., T1, T2, T3, T4, and P2). Behind each tab, student work demonstrating command of the respective outcome should be neatly presented. All materials must be three-hole punched, in a three-ring binder. A cover page is required and must include the student's name, the course number and title, and the term the course was taken, along with specific statements on how the example assignments have met (or partially met) the outcome objectives. The reviewed portfolio will be returned with the graded final projects.</p>
Portfolio Grading	The portfolio grade is part of the individual final report grade. If the portfolio is not submitted (or incomplete), the student will receive an incomplete for the class.
Academic Misconduct	Any act of dishonesty in any work constitutes academic misconduct. The university Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct and will be handled by the Dean's office.

Accommodations	Reasonable accommodations are made on an individualized basis. It is the responsibility of persons with disabilities, however, to seek available assistance and make their needs known. The University has designated the Office of Disability Services as the campus coordinating office for the provision and delivery of services and reasonable accommodations that ensure the University's programs, services, and activities are accessible to students with disabilities. The Office of Disability Services is available to assist any student who has a qualified and documented disability. Please contact the Office of Disability Services at 348-4285 for additional information.
Schedule/Topic Outline	<p>Topics that will be addressed during this course will include the following. Also shown are the general text pages for the topics. Numerous supplemental handouts and Internet references will also be used. Durations shown are approximate and may be adjusted as the semester progresses.</p> <p>There are a total of 46 class sessions scheduled for the term:</p> <p>Introduction (CHIN pgs 1 - 9)</p> <p>Module 1: Historical Urban Water Systems 1 class</p> <p>Review of conservation principles</p> <p>Module 2: Basic Principles of Fluids 1 class</p> <p>Flow in Closed Conduits (CHIN pgs 10 – 40) 5 classes</p> <p>Module 3a: Continuity, Momentum and Energy (Bernoulli)</p> <p>Module 3b: Darcy Weisbach</p> <p>Module 3c: Hazen Williams</p> <p>Module 3d: Manning</p> <p>Module 3e: Comparison of methods</p> <p>Pipe Networks (CHIN pgs 40 – 48; 64-89) 3 classes</p> <p>Module 4a: Water demand</p> <p>Module 4b: Water distribution system design</p> <p>Module 4c: EPANET2 example class version</p> <p>Pump performance and selection (CHIN 48 - 64) 2 classes</p> <p>Module 5: Pumps and storage</p> <p>Flow in open channels (CHIN 97 – 127; 127 – 145; 202 - 231) 7 classes</p> <p>Module 6: Channel Stability</p> <p>Module 6a: Manning's specific energy</p> <p>Module 6b: Water surface profiles</p> <p>Module 6c: Design and stable open channels</p> <p>Module 6d: Design of channels and habitat issues</p> <p>Module 6e: Stream buffers and land development</p> <p>Design of sanitary sewers (CHIN pgs 231 - 255) 4 classes</p> <p>Module 7: Sanitary sewer design</p> <p>Probability and statistical methods (CHIN pgs 271 - 328) 5 classes</p> <p>Module 8: Probability and statistics</p>

	<p>Surface water hydrology (CHIN pgs 334 - 424) 10 classes</p> <p>Module 9a: Rainfall and runoff introduction Module 9b: Runoff calculations with WinTR55 Module 9c1: WinTR55 for lab Module 9c2: WinTR55 ponds document Module 9d: Detention pond design with routing</p> <p>Design of storm sewer systems (CHIN pgs 479 - 541) 4 classes</p> <p>Module 10a: Storm sewer system design Module 10b: Gutters and inlet design Module 10c: Getting started with SWMM5 storm and sanitary documents Module 10d: Sediment movement in sewers</p> <p>Culvert design (CHIN pgs 185 - 202) 3 classes</p> <p>Module 11: Culvert hydraulics</p> <p>Adobe Acrobat pdf versions of the course PowerPoint presentations and supplementary material are available from the course website, located at: http://unix.eng.ua.edu/~rpitt/Class/Water%20Resources%20Engineering/WREMainPage.htm. Students can print out copies of these materials from the website.</p> <p>The anticipated schedule for the laboratory exercises will be handed out at the first laboratory session.</p>
Midterm Exam Date(s)	The interim major assignment due dates will be announced in class with sufficient time for completion.
Final Exam Date:	<p>First class: January 9, 2008 Class holiday (MLK day): January 21, 2008 First lab class: January 15, 2008 Spring break: March 17 – 21 (no classes on March 17, 19, or 21) Last day of class: May 24, 2008 Final exam: May 9, 2008, 11:30 to 2 pm</p>
Homework Format	The homework will be submitted in a professional and complete style. Almost all problems will require a necessary neat sketch. Grades will be reduced for poor organization and inappropriate use of significant figures. See the note on computer use for this class.
Other Course Information	A plus/minus grading system will be in effect for undergraduate students.

Contribution to Program Student Outcomes

As required for the accreditation of our BSCE program, the Civil Engineering program at The University of Alabama, in full consultation with its various constituencies, including alumni and employers, has established the several overarching student outcomes that must be met upon graduation. These outcomes

describe what students are expected to know or be able to do *at the time of graduation* from our program. To progress towards these outcomes, each course contributes both directly and indirectly to the development of various skills, specific to the course subject matter, that support these outcomes. At a minimum, the outcomes that are listed below will be fully or partially addressed specifically and in a significant manner in this course. Other outcomes may be addressed to a lesser extent.

Outcome	Description
Outcome T1: (Level 3)	Solve problems in mathematics through differential equations, probability and statistics, calculus-based physics, and general chemistry. The course assignments, quizzes and exams utilize mathematical and scientific skills and tools. (level 3).
Outcome T2: (Level 4)	Develop and conduct civil engineering experiments to meet a need, and analyze and interpret the resulting data. Students perform directed hydraulic experiments in the lab portion of this course. (level 3).
Outcome T3: (Level 3)	Apply knowledge in at least four technical areas appropriate to civil engineering, and apply relevant techniques, skills, and modern engineering tools to solve a simple problem. Students apply the fundamental principles of conservation of mass, momentum and energy for analyses and designs of practical problems in water resources engineering and management (level 3).
Outcome T4: (Level 5)	Design a complex system or process in more than one civil engineering context to meet desired needs, within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. Students in this course perform and document (through formal reports) designs of water supply networks, sanitary and storm sewer systems, and culverts (level 5).
Outcome P2: (Level 4)	Organize and deliver effective written, verbal, graphical and virtual communications. Students document their design projects in formal written reports, and lab exercises are also documented in written lab reports (level 4).