1. **Catalog Description:**
   (3 credits) Fundamental equations for pipe and open conduit flow. Development of design oriented formulas for pipes and open channels. Introduction to hydrology.

2. **Pre-requisites and Co-requisites:**
   CWR 3201 (Hydrodynamics) or consent of instructor.

3. **Course Objectives:**
   To familiarize the student with the analysis upon which modern hydraulic engineering design is based and with the design process itself. Emphasis is placed on the basic understanding of the potential and unavoidable limitations of today’s methods in hydraulic analysis and design. Provide students a suitable applied background in hydraulics through lectures, assignments, and software applications.

4. **Instructor:**
   Shirish Bhat, Ph.D., P.E.
   Office location: 580B Weil Hall
   Phone: 352-392-9537 × 1440
   E-mail address: sbhat@ufl.edu
   Office hours: Thursday 8th and 9th period (3:00 PM - 5:00 PM).

   *Email communication is highly encouraged* as it allows information to be shared more readily with the entire class. The class email list is automatically generated based upon the class roll maintained by the Registrar’s Office. As such students must have an active University GatorLink email address (typically of the form username@ufl.edu).

5. **Teaching Assistant (TA):**
   Bill Liu
   Office location: 457 Weil Hall
   Office Hours: Friday 12:00 PM – 4:00 PM E-mail address: liubill@ufl.edu

6. **Class schedule and Location:**
   Tuesday (Lecture) - Period 7 (1:55 PM – 2:45 PM) - FLG, Room 220
   Thursday (Lecture) - Period 7 (1:55 PM – 2:45 PM) - FLG, Room 280
   Wednesday (Problem Session) - Periods 9-10 (4:05 PM – 6:00 PM) - FLG, Room 220

   Classes will be held on Tuesday and Thursday during 7th period and a problem session will be held Wednesday afternoon during 9th and 10th period—attendance is strongly recommended.

7. **Attendance and Expectations:**
   There is no specific penalty for missing a class; however, attendance is strongly recommended. Students are responsible for the content of each lecture.
8. **Textbook and Software Required:**


   Recommended Reading: Chapters 1, 2, 3, 5, and 6.

   **Recommended Textbook:**


9. **Course Outline:** (list of topics)

   - Review of Fundamental Hydraulic Equations:
     - Conservation of Mass, Energy, and Momentum
     - Energy verses Momentum Coefficients
     - Combined Applications of Fundamental Hydraulic Equations
   
   - Unified Approach to Formulas for Pipe and Open Channel Flow:
     - Introduce concepts of hydraulic radius, energy losses, wall shear stress, friction velocity, and friction factors
     - Darcy-Weisbach’s equation
     - Velocity profiles for laminar and turbulent flow
     - Friction factors for laminar and turbulent flow
     - Development of rational power formulas for relationship between hydraulic radius, spatial mean velocity, discharge, energy loss, and pipe/channel or fluid properties
   
   - Empirical Formulas for Pipe and Open Channel Flow:
     - Chezy’s, Manning’s, and Hazen & William’s formulas
     - Limitations of empirical formulas
     - Software applications with FlowMaster and WaterGEMS (chapters 1 and 6)
   
   - Local Energy Losses
     - Introduction to local energy losses
     - Sudden enlargements and reductions of flow area
     - Inlets and outlets
     - Gradual enlargements and reductions of flow area
     - Bends and knees and valves and gates
     - Equivalent lengths
     - Software applications with FlowMaster and WaterGEMS (chapters 1 and 6)
   
   - Pipes, Pipe Systems and Networks
     - Characteristic equation, P-value for pipe, pipe sizes
     - Pipes in series and parallel
     - Composite pipe systems and networks
     - Software applications with FlowMaster and WaterGEMS (chapters 1 and 6)
   
   - Open Channels, Uniform Flow
     - Normal depth and mean normal depth of rectangular, trapezoidal, triangular, and partially filled circular channels
     - Optimum design of trapezoidal channels
 Specific energy, critical depth, and mean critical depth of rectangular, trapezoidal, triangular, and partially filled circular channels
Software applications with FlowMaster and StormCAD (chapters 1 and 3)

➢ Open Channels, Rapidly Varied Flow
   ❖ Flow over broad crested weir
   ❖ Flow over channel obstructions (with supercritical and subcritical flow)
   ❖ Transitions from subcritical to supercritical flow
   ❖ Transitions from supercritical to subcritical flow (hydraulic jumps)
Software applications with FlowMaster and CulvertMaster (chapters 1 and 4)

➢ Open Channels, Gradually Varied Flow
   ❖ Backwater and drawdown curves
   ❖ Computational methods (the direct step method)
   ❖ Computational methods (the standard step method)
Software applications with StormCAD and PondPack (chapters 3 and 5)

➢ Introduction to Surface Hydrology
   ❖ Hydrologic Budgets
   ❖ Precipitation, Runoff, Infiltration, and Evapotranspiration
   ❖ Storm Runoff Modeling
Software applications with StormCAD and PondPack (chapters 3 and 5)

10. Tests:
Three 1.5-hour closed-book, closed notes exams and one class project are scheduled as follows: Exam 1: September 19, 2012; 4:05-5:35 PM (Room 220).
Exam 2: October 17, 2012; 4:05-5:35 PM (Room 220).
Exam 3: November 14, 2012; 4:05-5:35 PM (Room 220).
Class project: Due December 5, 2012 at the beginning of class.

11. Homework:
Homework will be assigned regularly.

12. Grading
Homework --- 30% Exam --- 20% each Class Project --- 10%

13. Grading Scale:

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<tr>
<th>Final Average</th>
<th>Letter Grade</th>
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<tbody>
<tr>
<td>90 to 100</td>
<td>A</td>
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<tr>
<td>85 to 89</td>
<td>B+</td>
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<td>80 to 84</td>
<td>B</td>
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<td>75 to 79</td>
<td>C+</td>
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<td>65 to 69</td>
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<td>60 to 64</td>
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<tr>
<td>Less than 60</td>
<td>E</td>
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Information on current UF grading policies for assigning grade points may be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx
14. **Grading Policy:**
Homework assignments should be turned in on their due dates; the grade on a homework assignment turned in late will be deducted at a rate of 10 points per week. If there are questions about grading, a written statement must be submitted with a copy of the test problem in question. Once reviewed, the statement and final decision will be returned. No face-to-face grade lobbying will be permitted.

15. **Make-up Exam Policy:**
Make-up exams will be allowed only in cases of valid medical excuses or an absence approved in advance by the instructor.

16. **Honesty Policy:**
All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

17. **Accommodation for Students with Disabilities:**
Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

18. **UF Counseling Services:**
Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

19. **Software Use:**
All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.