1. **Department, number, and title of course**

Department of Civil Engineering, CENG 5333, Computer Modeling in Water Resources and Environmental Engineering

2. **Graduate Course**

3. **Course (catalog) description**

The course will familiarize students with several computer-based models for analyzing and designing a variety of water resources and environmental engineering applications. In addition to using existing software programs common throughout industry, students will also create their own simulation and optimization models using Visual Basic for Applications (VBA).

4. **Prerequisite(s)**

CENG 3361 Applied Engineering Hydrology and Hydraulics w/Lab
MENG 3310 Fluid Mechanics

5. **Textbook(s) and/or other required material**

None

6. **Course Objectives**

- Apply the water balance models in a variety of integrated water resource planning and environmental analysis applications.
- Understand and apply a systems approach for analyzing water resource and environmental engineering problems.
- Develop simulation and optimization models within MS Excel for problem solving in reservoir operation, resource allocation, and environmental pollution applications.
- Apply various models to simulate rainfall-runoff quantity and quality, airshed quality and contaminant distribution.
- Design and analyze a design water distribution system using currently available analysis programs.

7. **Topics Covered**

- Water Distribution Systems Analysis and Design
- Stormwater Infiltration and Runoff
- Water Balance Modeling
- Air Quality Modeling
- VBA Programming Language
- Computer-Based Simulation and Optimization Modeling
- Multi-Criterion Decision Analysis

8. **Class/laboratory schedule, i.e., number of sessions each week and duration of each session**

LESSONS: 30 @ 50 min (2 att/wk)  
LABS: 3 hrs/wk.
9. **Contribution of course to meeting the professional component**

3.0 Credit Hours (ES=2.0, ED=1.0)

Computer models play a crucial role in water resources and environmental applications by allowing the user to improve decision making through the evaluation of multiple alternatives. In the first portion of the course, students learn how to use several existing software packages common to the water resource and environmental industries. As students develop a familiarity with each program, they gain valuable insight with regard to each program’s limitations and uses. Having used existing models in various applications, the second portion of the course introduces students to systemic procedures for developing their own simulation and optimization models. While not all students will become model developers, this activity enables students to understand the model development process.

10. **Relationship of course to program outcomes**

The course director’s assessment of how this course contributes to the civil engineering program outcomes is listed below. The following scale is used:

1=No Contribution; 2=Small Contribution; 3=Average Contribution; 4=Large Contribution; 5=Very Large Contribution

<table>
<thead>
<tr>
<th>CIVIL ENGINEERING PROGRAM OUTCOMES</th>
<th>Course Director Assessment</th>
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<tbody>
<tr>
<td>Students who qualify for graduation with a civil engineering masters will demonstrate:</td>
<td></td>
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<tr>
<td>Have specialized knowledge in an area of civil engineering beyond that normally expected at the undergraduate level.</td>
<td>5</td>
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<tr>
<td>Are adequately prepared for advanced professional practice.</td>
<td>5</td>
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<tr>
<td>Completing a thesis or design project address a civil engineering problem using sound engineering principles and techniques.</td>
<td>3</td>
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<tr>
<td>Solve an engineering problem of importance to the State, the Nation, or the Global community.</td>
<td>4</td>
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<tr>
<td>Demonstrate the ability for independent life-long learning.</td>
<td>4</td>
</tr>
<tr>
<td>Have effective oral, written, and graphical communication skills.</td>
<td>3</td>
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11. **Person(s) who prepared this description and date of preparation**

Dr. Peter D. Rogers, PE, Assistant Professor, 9 June 2008.