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

   Department of Civil Engineering, CENG 5337, GPS and GIS Applications in Water Resources and Environmental Engineering

2. **Required Course**

3. **Course (catalog) description**

   This course provides students with an introduction to the general concepts and applications of Global Positioning Systems and Geographic Information Systems through several project-based water resources and environmental engineering applications. Through their work on various real-world problems, students develop insight with regard to spatial-based applications and the diversity of each technology’s potential applications. The course will emphasize the use of both technologies as part of an integrated planning and decision making process.

4. **Prerequisite(s)**

   MENG 3310, Fluid Mechanics, or equivalent course in Open Channel Flow
   CENG 2336 Geomatics

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

   None

6. **Course Objectives**

   - Describe the fundamentals of each technology and develop fluency in GPS and GIS concepts and terminology.
   - Explain how both spatial technologies can be used in water resources and environmental engineering applications.
   - Perform a GPS survey as part of a water resource or environmental engineering application.
   - Apply ArcGIS in a variety of water resources and environmental engineering applications.

7. **Topics Covered**

   - GPS Introduction and Basics
   - Entering GPS Data into GIS
   - GPS Signal Structures
   - Differential GPS
   - GPS Positioning Modes
   - Datums, Coordinate Systems, and Map Projections
   - GIS Introduction and Basics
   - Integration of GPS and GIS
   - Raster and Vector GIS
   - Analyzing Spatial Relationships

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

   LESSONS: 32 @ 50 min (2 att/wk)  
   LABS: 3 hrs/wk.
9. **Contribution of course to meeting the professional component**

3.0 Credit Hours (ES=3.0, ED=0)

This course is unique in that it teaches students about GIS and GPS through the use of project-based applications in their areas of interest. Gaining familiarity with each technology through practice, students gain insights with regard to the flexibility and diversity of each technology. The goal of the course is not to make each student a master of each product, however, but to foster an understanding of the numerous applications of each technology and how each enables decision makers to make better-informed decisions.

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>4</td>
</tr>
<tr>
<td>Solve an engineering problem of importance to the State, the Nation, or the Global community.</td>
<td>5</td>
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<tr>
<td>Demonstrate the ability for independent life-long learning.</td>
<td>4</td>
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<tr>
<td>Have effective oral, written, and graphical communication skills.</td>
<td>2</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, 25 October 2008