

## UMBC UGC New Course Request: GES 419 - Watershed Analysis

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	name	email	phone	dept
dept chair	Sandy Parker	<a href="mailto:eparker@umbc.edu">eparker@umbc.edu</a>	5-3153	GES
contact	Matthew Baker	<a href="mailto:mbaker@umbc.edu">mbaker@umbc.edu</a>	5-3759	GES

### COURSE INFORMATION:

course number(s)	GES 419
formal title	Watershed Analysis & Modeling
transcript title (≤24c)	Watershed Analysis
prerequisite	GES 386 AND either GES 319 OR GES 411 OR GES 416
credits	3
max. repeat credits	
grading method(s)	<input checked="" type="checkbox"/> Reg (A-F) <input type="checkbox"/> Audit <input type="checkbox"/> Pass-Fail

### PROPOSED CATALOG DESCRIPTION:

This course will involve application of Geographic Information Systems in the analysis of water resources and watershed condition. Beginning with an introduction to the ArcHydro and TauDEM data models, students will explore digital mapping of water resources information, terrain analysis using digital elevation models, and delineation of river and watershed networks. Through integration of time-series and geospatial data students will be exposed to hydrologic principles of hydrologic modeling.

### RATIONALE FOR NEW COURSE:

No course like this exists at the school. Provides an important element currently missing within the Geography and Environmental Science Curriculum. May also be of interest to civil and environmental engineering students.

### ATTACH COURSE OUTLINE:

#### Course Description

This course will involve application of Geographic Information Systems in the analysis of water resources and watershed condition. Beginning with an introduction to the ArcHydro data model, students will explore digital mapping of water resources information, terrain analysis using digital elevation models, and delineation of river and watershed networks. Through integration of time-series and geospatial data students will be exposed to hydrologic principles of hydrologic modeling.

#### Prerequisites

GES 386 AND GES 319 OR GES 411 OR GES 416

#### Course Text

The readings for this course will be taken from: "Arc Hydro: GIS for Water Resources" Ed by David R. Maidment, published by ESRI Press, 2002, \$59.95 ISBN 1-58948-034-1, see <http://gis.esri.com/esripress/display/index.cfm>

#### Course Objectives

The course is composed of eight modules that will enable students to:

\* Develop a Hydrologic Information System that links time series of water observations to locations where the measurements are made;

- \* Create a base map of a study region including watersheds, streams, and aquifers by selecting features from regional maps;
- \* Analyze a digital elevation model of land surface terrain to derive watersheds and stream networks;
- \* Interpolate measured data at points to form raster surfaces over a region, and spatially average those surfaces over polygons of interest;
- \* Perform hydrologic calculations using map algebra on raster grids;
- \* Apply the Arc Hydro data model to a set of streams, watersheds, water bodies, monitoring points and time series of information measured at those points;
- \* Develop data structure to parameterize and calibrate simple hydrologic models
  1. To develop familiarity with the theory underlying GIS data models for hydrologic applications.
  2. To understand the core functions underlying fundamental operations for terrain analysis which form the basis of watershed characterization.
  3. To acquire practical skills for watershed analysis including watershed delineation, stream mapping, DEM burning, and flow-field operations.
  4. To learn the fundamentals of hydrologic models and how they can be informed by geographic characterizations.
  5. To complete an term project where students use their skills and understanding to address a research question in applied or theoretical environmental science.

### **Computer Environment**

This course uses the ArcGIS version 9.3 software. The Spatial Analyst and 3D Analyst extensions of ArcGIS will also be used in the course, as well as a custom TauDEM toolbox. These programs run under the Windows operating system.

If you have access to the software elsewhere, you can do the computer assignments at that location. You should plan to back up your work on a removable drive (e.g. zip or thumb) to avoid complications from lack of disk space in your personal area.

### **Method of Evaluation**

Course grades will be based on a weighted average of results as follows:

- Homework 20%
- Term Project Written Report 30%
- Term Project Oral Presentation 10%
- Midterm Exam 20%
- Final Exam 20%

The midterm exam will be an in class exam. The final exam will be a take home exam handed out during the last class and due 1 week after the last class. This final exam will include project type GIS analysis as well as essays and short reports that synthesize material from the class and from the term projects of other students in the class.