Example Syllabus: Introduction to Geospatial Programming

COURSE DESCRIPTION: The course provides an understanding of how to customize GIS software applications by way of modified service interface elements. Topics include the theory and implementation of the various scripting languages currently in use. Upon completion, students will be able to solve geospatial problems and streamline GIS workflows through the creation and modification of scripts.

PREREQUISITES: Introductory Geospatial Technology course using Geographic Information Systems Software.

STUDENT LEARNING OUTCOMES (SLOs):

1. Students will produce solutions to automate geoprocessing functions using a variety of programming methods, structures, and data sources.
2. Students will use a scripting language to modify and create geoprocessing scripts.
3. Students will construct, compile, and troubleshoot computer code according to best practices
4. Students will solve geospatial problems and streamline GIS workflows through the design and development of custom GIS applications.
5. Students will modify user interfaces to increase productivity.

COURSE OUTLINE AND RESOURCES:

Specific material/exercises/data/exams are at the discretion of the developer and are offered as samples, not mandatory components in the course. Our objective is to provide as complete a model course outline as possible without being too prescriptive on the precise course content. It is expected faculty that adopt these outlines will modify the material to meet their own local industry needs.

Units	Unit Objectives
1. Basics of geoprocessing and its languages	Students will learn the basics of GIS modeling and geoprocessing. They will be introduced to various programming languages available to create/customize geoprocessing applications. Students will learn though a simple example of geoprocessing application using the selected programming language. (SLO 1)
2. Programming fundamentals 1	Students will learn basic syntax of selected programming language. This unit, we will cover language essentials including data types, operators, variables, methods and events. (SLO 2, 3)
3. Programming fundamentals 2	Students will be introduced Object Oriented Programming including classes, interfaces, libraries/assemblies. (SLO 2, 3)

4. Working with maps, layers and layer rendering	Students will learn how to programming with objects in maps and layers module. They will also understanding different layer rendering methods and how to implement them by code. (SLO 2, 3, 4, 5)
5. Data access and creation with geodatabase	Students will learn how access spatial attribute data from a geodatabase as well as create new dataset and store them into geodatabase. (SLO 2, 3, 4, 5)
6. Working with geometry and selections	Students will understand the types of geometry and the topological, relational, and proximity operators. They will learn how to use operators to make a spatial selection and how to work with the selected set. (SLO 2, 3, 4, 5)
7. Working with map layout	Students will be introduced to the elements of a map layout. They will learn how to create maps with different layout elements by code. (SLO 2, 3, 4, 5)
8. Final Project	Students will complete a project utilizing the skills they gained from this class. (SLO 1, 2, 3, 4, 5)

*Refer to the GST101: Introduction to Geospatial Technology Model Course Outline for unit alignment with the Geospatial Technology Competency Model

METHODS OF EVALUATION: A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

- Quizzes
- Lab Exercises
- Final Project

METHODS OF INSTRUCTION: Methods of instruction may include, but are not limited to, the following:

- Lecture Discussion
- Learning Modules
- Audio-Visual
- Collaborative Learning
- Lecture-Lab Combination
- Computer Assisted Instruction

REQUIRED TEXTS AND SUPPLIES:

1. Reading materials may include, but are not limited to:
   a. TEXTBOOKS:
      Westra, Erik. 2010. Python Geospatial Development. 1st Edition. Published by Packt Publishing Ltd.

Murach, Joel, 2010. Murach's C# 2010. 1st Edition. Mike Murach & Associates, Inc.
Luts, Mark. 2009. Learning Python: Powerful Object-Oriented Programming. Fourth Edition. O'Reilly.

b. OTHER:
GeoTech Teaching Resources, http://www.geotechcenter.org
ESRI Developer Network, http://resources.arcgis.com/en/help/arcobjects-net/conceptualhelp/
Virtual Course: Using Python in ArcGIS Desktop 10: http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&CourseID=1868

2. SOFTWARE: Access to industry standard geospatial software.
3. SUPPLIES: Computer with an internet connection.

Date: July 2012; Author: Vincent A. DiNoto, Jr.; Dean of College and Systemic Initiatives; Jefferson Community and Technical College; Co-PI GeoTech Center

Funded by the National Science Foundation (NSF) Advanced Technological Education program (DUE #0801893). Author's opinions are not necessarily shared by the NSF.