Geography 5223: Design and Implementation of GIS

The Ohio State University

Spring 2016

Location: Jennings Hall 0040 (Monday), Derby Hall 0140 (Wednesday)
Time: Monday and Wednesday 3:55 - 5:15 PM
Course URL: http://carmen.osu.edu

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This course covers design and implementation techniques that are commonly used in developing today's geographical information systems and other computer programs for spatial analysis. Major topics of this class include project management, requirement analysis, spatial database design, object-oriented analysis and design, unified modeling language, and system verification and validation. Students will learn the GIS development skills using different programming languages through weekly lab exercises and group projects that address "real-world" GIS application problems.

The topics covered in this course are selected to help students achieve the following goals:

- Understanding the design and implementation issues in GIS development
- Mastering basic software development techniques, especially those using object-oriented approaches
- Understanding spatial database design techniques
- Developing personal experience of GIS development through hands-on labs and projects
- Understanding GIS related ethical issues

Texts

The following two books are required for the lecture and labs:

- Schmuller, J. 2004, *SAMS Teach Yourself UML in 24 Hours*, 3rd Ed. SAMS Publishing.
- Zandbergen, P. 2015. *Python Scripting for ArcGIS*. ESRI Press.

In addition to the above required texts, the following two books will also be useful for many topics covered in this class and therefore they are recommended for your reference.

- Wiegers, K. and Beatty, J. 2013. Software Requirements. 3rd Ed. Microsoft Press.

- Sommerville, I. 2006. *Software Engineering*. 8th Ed. Addison Wesley Publishers. (Newer editions of this book are also good.)

The lectures do not necessarily follow the textbooks. Instead, I will use my own lecture notes, which will be made available on the course web site. Therefore, students are expected to attend each class and participate in discussion and exercises. Further readings, when applicable, will be handed out during the class.

Prerequisites

Geography 5210 or 5220 or consent of instructor.

Credit Hours

This class is for 3 credits.

Evaluation

Student performance is assessed by the following five components:

- **Labs (30%)**. Hands-on approaches will be used. Nine of the ten weekly labs are based on the book *Python Scripting for ArcGIS* and supplementary materials; the lab about ArcGIS add-ins will be based on hand-out instructions. Unless otherwise announced, all assignments are due in one week. Late submission will result in a deduction in the total points of that assignment, unless a good, acceptable reason is provided *priori* to the due date/time of the assignment.
- **Group Project (30%)**. Students attending this class will be divided into several groups, each working on a GIS development project. Members of each group will determine necessary working teams to fulfill different design and implementation goals of the project. The projects should be concluded by (a) delivering the final products including a full set of documentations to the clients, and (b) professionally presenting the project to the clients and the class. During the semester, a number of formal presentations will be made by each group to the class to report the progress. These presentations are mandatory. The performance of each group and hence its members will be reviewed by peers (groups and individuals) and their client. Detailed review instruction and forms will be handed out. It is important for each group to deliver their product by the time specified in the schedule. <u>Also, the final grade of this class is pending on confirmation of safe delivery of the produce.</u> Groups that do not believer the complete package on time will not receive any credit for the project.
- **Examination (20%)**. A comprehensive examination will be given in the finals week.
- **Homework (15%)**. There will be at least two homework assignments. The date on the schedule specifies when the homework will be handed out. A homework assignment is normally due in one week and the specific date/time will be indicated on the handout.
- **Case studies and participation (5%)**. Attendance and participation in class discussion are expected of all students. There will be a number of in class exercises or quizzes. In addition to attending the lecture, students should also play an active role in case studies. Each group is responsible to study one of the case studies and present it to the class. It is not necessary for the entire group to work on the case study. Instead it is important for each group to designate one or more members to concentrate the case study.

Important Issues

- **Students with Disabilities:** I would like to hear from anyone who has a disability that may

require some modification of seating, testing, or other class requirements so that appropriate arrangements may be made. Please talk with me after class or during my office hours. If you need more information about disabilities and accommodations, contact the Office of Disability Services.

- **Policy on Plagiarism and Academic Misconduct:** In the Code of Student Conduct, academic misconduct is defined as "any activity that tends to compromise the academic integrity of the university, or subvert the educational process"; plagiarism is defined as "the representation of another's work or ideas as one's own; it includes the unacknowledged word-for-word use and/or paraphrasing of another person's work, and/or the inappropriate unacknowledged use of another person's ideas." **Plagiarism is wrong and should be prohibited.** The University has a policy on academic misconduct and plagiarism, as provided in the Code of Student Conduct. To further understand this, it is worthwhile to read the Eight Cardinal Rules of Academic Integrity at http://www.northwestern.edu/uacc/8cards.html and guidelines to avoid plagiarism at http://www.northwestern.edu/uacc/plagiar.html.

Schedule

The **schedule** will be updated whenever new materials become available.

Last update: 01/15/2016 07:42:44

Geography 5223: Course Schedule

This is a tentative schedule. The links below will be made available before class. There are four components in this schedule: lecture topics, labs, project activies, case studies, and homework.

Week	Lecture	Coding lab
1	1/11 Software development	1/13 Guest lecture
2	1/18 No class (MLK)	1/20 Python (1-3, 4.1-4.8)
3	1/25 Requirements Groups formation	1/27 Python (4.9-4.21)
4	2/1 Project management	2/3 Geoprocessing (2, 5)
5	2/8 Software design Progress reports	2/10 Spatial data (6)
6	2/15 UML: Object-orientation Homework 1	2/17 Spatial data (7)
7	2/22 UML: Use cases	2/24 Geometry (8.1-8.8)
8	2/27 UML: More diagrams	3/2 Rasters (9.1-9.8)
9	3/7 Case study: ethics Progress reports	3/9 Functions & classes (12)
	3/14	3/16

10	No class (Sprint break)	No class (Sprint break)
11	3/21 UML: Applications	3/23 Custom tools (13)
12	3/28 UML: Coding Homework 2	3/30 No class (AAG)
13	4/4 Software inspection	4/6 Add-ins (+)
14	4/11 Software testing	4/13 Projects
15	4/18 Case study: GIS and people	4/20 Projects
16	4/25 Presentations and evaluation	4/27 Package delivery
17	5/2 Monday Final Exam (4-5:45 PM)	