GEOG 377 Introduction to Geographic Information Systems

(Course syllabus, Spring 2016)

Instructor Guiming Zhang

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Office Hours Tuesday and Thursday: 2pm – 4pm

Lecture hours & location:

Tue & Thu 4:00 - 5:15pm, Rm180 Science Hall

Lab hours & Location:

Section 301: Mon 12:45pm – 2:45pm, Rm380 Science Hall

Section 302: Mon 3 - 5pm, Rm380 Science Hall

Section 303: Tue 1:45pm – 3:45pm, Rm380 Science Hall

Section 304: Mon 6 –8pm, Rm380 Science Hall

Recommended Text:

Course website: https://sites.google.com/a/wisc.edu/intro-to-gis/

Longley P.A., M.F. Goodchild, D.J. Maguire, D.W. Rhind, 2011.Geographic Information Systems and Science. John Wiley and Sons, New Jersey, 517 p. (A hard copy on reserve in Geography Library)

Chang, K.T., 2012. Introduction to Geographic Information Systems (Sixth Edition). McGraw Hill, New York, 418 p (A hard copy on reserve in Geography Library)

de Smith, M., Goodchild, M., Longley, P., 2013. Geospatial Analysis: A Comprehensive Guide (www.spatialanalysisonline.com)

Description:

The field of Geographic Information Systems, GIS, is concerned with the description, analysis, and management of geographic information. This course offers an introduction to methods of managing and processing geographic information. Emphasis will be placed on the nature of geographic information, data models and structures for geographic information, geographic data input, data manipulation and data storage, spatial analytic and modeling techniques, and error analysis.

The course is made of two components: lectures and labs. In the lectures, the conceptual elements of the above topics will be discussed. The labs are designed in such a way that students will gain first-hand experience in data input, data management, data analyses, and result presentation in a geographical information system.

Students must be clear that this is not a class specifically on any particular GIS software. It is a course on the underlying theory and concepts in GIS. The understanding of these concepts and theories will help you to perform spatial analysis in any GIS system properly and efficiently.

Goals:

In general, this is an ice-breaking course into GIS and serves as the foundation course for other advanced courses in GIS. The basic objectives of this course for students are:

1. To understand the basic structures, concepts, and theories of GIS
2. To gain a hand-on experience with a variety of GIS operations

Pre-requisites:

Introductory courses in environmental or mapping sciences or instructor consent.

Computing Environment and Software:

ArcGIS 10.3 will be used for class assignments to illustrate the practical use of certain geographic information processing concepts and techniques.

Evaluation:

To meet the new requirements of graduate school toward graduate program, this class evaluates graduate students and undergraduate students separately. For undergraduate students, the evaluation includes four components listed below, adding up to 100% in total. For graduate students, the evaluation includes five components, of which four are listed below. An additional component (10%) as class presentation is listed separately solely for the graduate students. Points for graduate student (in total 110%) will multiple a factor of 0.909 to be normalized to 100%.

Components:

Lab exercises ……..**35%**

Exam I ……...**30%**

Exam II …….**30%**

Quizzes (in class) ……..... **5%**

Class presentation (graduate student only):

Graduate students need to review a journal article (or multiple articles) and give a presentation in the class. The article or articles can relate to GIS concepts, theories, or applications. An article in your discipline is preferred for you to review, for the reason that it would help you to think how to apply GIS in your work in the future.

The presentation is tentatively set on **April 26th** and/or **April 28th**, contingent upon the number of graduate students enrolled in our class. To present your reviewed article, you need to prepare five to eight slides in the format of PowerPoint, which would take approximately five to six minutes to present. In your slides, one of them would be how GIS is helpful in the article. You will have one or two minutes to answer the questions raised by the audience. All students will evaluate the clarity of your presentation. And Instructor and TAs will evaluate the academic merits of your presentation.

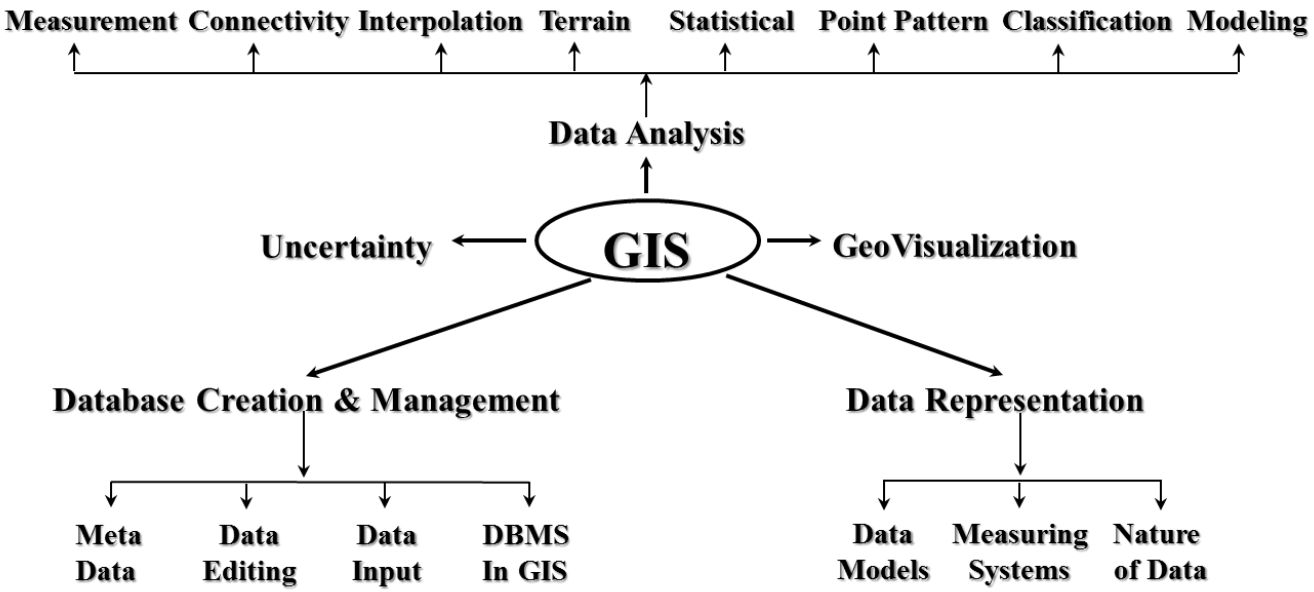
Please keep two important dates in mind. Please send me the article (or articles) that you are going to review to me by **April 12th**, and please send me your PowerPoint slides by **April 25th**. If you have any questions about selecting articles that you would like to review and present, please feel free to email me or come to my office hour.

Grading Policy:

Grades of exercises and exams are based on:

1) Academic merit of your answers to the questions;
2) Conciseness of answers;
3) Organization of your answers.

Course Overview:



Course Schedule:

Date	Topic
Jan 19th	Lec1 Course Overview GIS Overview
Jan 21st	Lec 2 The Nature of Geographic Information
Jan 26th	Lec 3 Data Representation: Measuring Systems: Location – Coordinate Systems
Jan 28th	Lec 3 Data Representation: Measuring Systems: Location – Coordinate Systems (Continue)
Feb 2nd	Lec 4 Data Representation: Measuring Systems: Location – Coordinate Transformation
Feb 4th	Lec 5 Data Representation: Measuring Systems: Topology Measuring Systems: Attributes
Feb 9th	Lec 6 Data Representation: Spatial Data Models: Introduction to spatial data models Spatial Data Models: Raster data models
Feb 11th	Lec 7 Data Representation: Spatial Data Models: Relational Data Models Spatial Data Models: Vector Data Models (I)
Feb 16th	Lec 8 Data Representation: Spatial Data Models: Vector Data Models (II)
Feb 18th	Lec 9 Data Representation: Spatial Data Models: TIN Summary of Spatial Data Models: Raster, Vector, TIN
Feb 23rd	Lec 10 Data Representation: Linking attribute data with spatial data Recent Development of Data models
Feb 25th	Lec 11 GIS Database Creation and Maintenance (I) Data Input & Editing
Mar 1st	Lec 12 GIS Database Creation and Maintenance (II) DBMS and its use in GIS
Mar 3rd	Review for Exam 1
Mar 8th	**Exam 1**: 75 min (Tuesday, 4 – 5:15pm, Rm 180 Science Hall)

Mar 10th	Lec 13 GIS Database Creation and Maintenance (III) Metadata / Database creation Guidelines / NSDI
Mar 15th	Lec 14 Data Analysis: Measurement & Connectivity
Mar 17th	Lec 15 Data Analysis: Interpolation
Mar 22nd	Spring Recess
Mar 24th	Spring Recess
Mar 29th	Lec 16 Data Analysis: Digital Terrain Analysis
Mar 31st	Lec 17 Data Analysis: Statistical Operations & Point Pattern Analysis
Apr 5th	Lec 18 Data Analysis: Classification
Apr 7th	Lec 19 Data Analysis: GIS-based Modeling and Spatial Overlay (I)
Apr 12th	Lec 20 Data Analysis: GIS-based Modeling and Spatial Overlay (II)
Apr 14th	Lec 21 Data Analysis: Summary Uncertainty
Apr 19th	Lec 22 Geo-representation, Geo-presentation, and GeoVisualization
Apr 21st	GIS Applications: Guest lecture
Apr 26th	Graduate student presentation
Apr 28th	Graduate student presentation
May 3rd	Lec 24 Establishing a GIS site
May 5th	Review for Exam II
May 9th	**Exam II**: 120 min (2:45 - 4:45PM, Rm: TBD)

Other important issues

The first exam will be held on **Mar 8th** during regular class time. The second exam will be held during 2:45 - 4:45PM on **May 9th** (Rm TBD). We offer a complimentary time for each exam, in case of conflicting schedule. If you cannot take either exam in the regular time, please directly notify me via email in *one week* advance. We are not able to accommodate if you give me a short notice. All regrading issues should be resolved in the week after handing the exams back to you.

In addition, we will have in-class quizzes at unannounced time point once in two weeks, starting from the second week. Each quiz will be three to five questions only, either in true/false format or multiple choices. By the end of the semester, we will count the highest five scores toward your final grade. However, if you miss any quiz without notice in advance (i.e., four hours before the lecture starts), we will directly deduct 1% from your final grade until all 5% quiz points have been deducted, however well you managed for the other quiz.

Examinations:

Exam 1: Mar 8th, Tuesday, 4 – 5:15pm, Rm 180 Science Hall

Exam 2: May 9th, Monday, 2:45 - 4:45pm**,** Rm TBD