

# GEOG 377 Introduction to Geographic Information Systems

(Course syllabus, Spring 2016)

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**Office Hours** Tuesday and Thursday: 2pm – 4pm

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## **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](http://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 .....	<b>35%</b>
Exam I .....	<b>30%</b>
Exam II .....	<b>30%</b>
Quizzes (in class) .....	<b>5%</b>

**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 26<sup>th</sup>** and/or **April 28<sup>th</sup>**, 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.

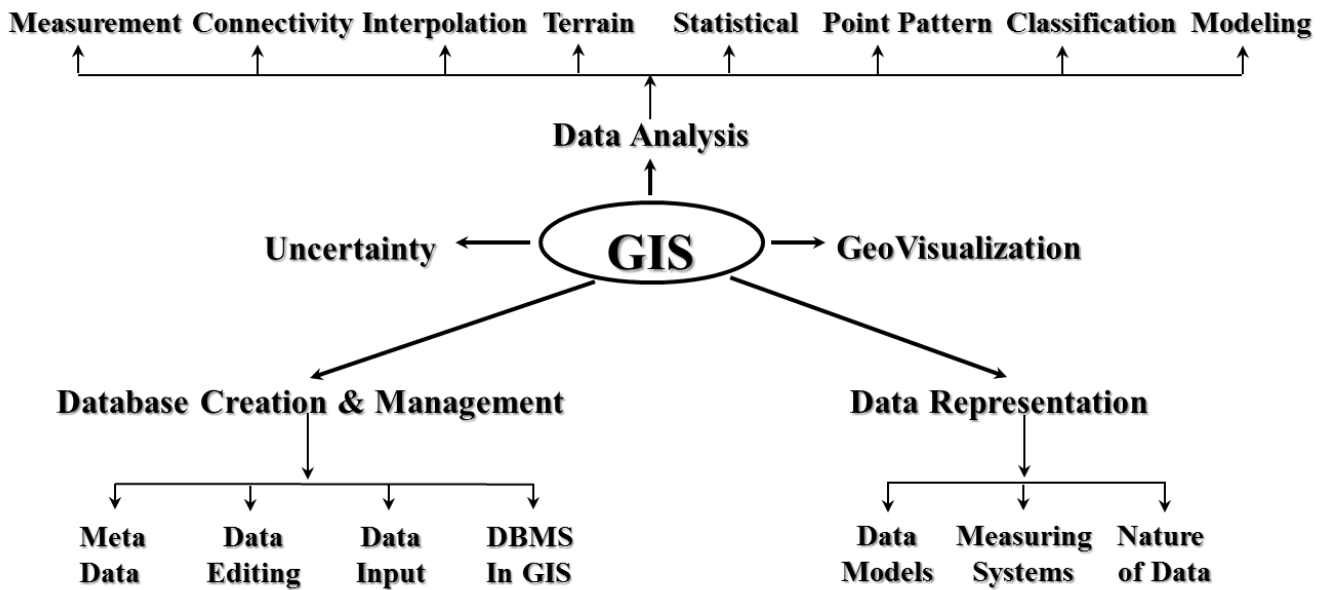
Please keep two important dates in mind. Please send me the article (or articles) that you are going to review to me by **April 12<sup>th</sup>**, and please send me your PowerPoint slides by **April 25<sup>th</sup>**. If you have any questions about selecting articles that you would like to review and 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:**

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

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

### **Other important issues**

The first exam will be held on **Mar 8<sup>th</sup>** during regular class time. The second exam will be held during 2:45 - 4:45PM on **May 9<sup>th</sup>** (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 8<sup>th</sup>, Tuesday, 4 – 5:15pm, Rm 180 Science Hall

Exam 2: May 9<sup>th</sup>, Monday, 2:45 - 4:45pm, Rm TBD