



## Geographic Information Systems for Geology and Planetary Sciences GE 110, Fall 2008



---

### Meeting Schedule

**Organizational Meeting:** Monday September 29, 2008

**Time:** 14:00 pm-14:55 pm

**Location:** 309 N. Mudd (GIS Lab)

**Lecture:** M 2:00 – 3:00 pm

**Lab:** TH 1:00 – 3:00 pm

---

### Contact Information

Professor: Jean-Philippe Avouac

Office: 301 N. Mudd

Email: [avouac@gps.caltech.edu](mailto:avouac@gps.caltech.edu)

Office Hours: TBA

GIS Trainer: Lisa Christiansen

Office: 302 N. Mudd

Email: [lisac@gps.caltech.edu](mailto:lisac@gps.caltech.edu)

Office Hours: By appointment

TA: Yu Wang

Office: 312 N. Mudd

Email: [wangyu79@gps.caltech.edu](mailto:wangyu79@gps.caltech.edu)

Office Hours: TBA

---

### Overview

**Ge 110** Geographic Information System for Geology and Planetary Sciences. 3 units (0-3-0)

#### Summary

This course is an introduction to the application of Geographic Information Systems (GIS) in Earth and planetary sciences. GIS is a computer-based system used for mapping and geospatial analysis. The goal of the course is to provide a solid foundation in the principles of GIS concentrating on how it is used as a research tool in Earth and planetary sciences.

#### Organization

The class will meet on Monday from 2:00-3:00 pm and Thursdays from 1:00-3:00 pm. The classes will cover the GIS principles and the labs will take the form of practical lab exercises mainly using ArcGIS software developed by ESRI. There will also be a brief introduction to ERDAS, ENVI and Google Earth. The labs will incorporate a variety of data sets for Earth and Mars including Digital Elevation Models, geodetic measurements, satellite images, and geological maps. There will be a final GIS project of your choice due on December 1<sup>st</sup> (the last day of class for GE 110).

#### Suggest Reading

*GIS Fundamentals: A First Text on Geographic Information Systems, 2nd Ed. (Paul Bolstad)*

#### Grading

50% Labs (labs will be due at the beginning of class the following Monday) 1 lab of your choice optional

50% Final GIS project (informal presentation the last week of class)

**Class Schedule: The following schedule is tentative and subject to revision.**

Week	Monday 2-3 pm	Thursdays 1-3 pm GIS Lab Reserved 1-4 pm	Suggested Reading
<b>WEEK 1</b> Sep 29 - Oct 3	Organization Meeting Course Mechanics	<b>Lecture:</b> Introduction to GIS <b>Lab1: Introduction to ArcGIS</b>	1-An Introduction (14-21)
<b>WEEK 2</b> Oct 6-10	<b>Lecture:</b> Overview of Data Models	<b>Lecture:</b> Data Formats, Sources, Standards GIS Project Management Symbology	2-Data Models (25-44, 46-47) 4-Data Sources and Data Entry (111-135, 139-150)
<b>WEEK 3</b> Oct 13-17	<b>Lab 2:</b> Building GIS Project using existing Data Map Layout	<b>Lab 3: GPS</b> Field Data Collection Adding XY Events Exporting to shapefile Creating & Editing Data Topology	5-The Global Positioning System
<b>WEEK 4</b> Oct 20-24	<b>Lecture: Map Projections &amp; Coordinate Systems</b> Map Scale Map Projections Datum Transformation Georeferencing	<b>Lab 4: Map Projections &amp; Coordinate Systems</b> Map Scale Map Projections Datum Transformations	3-Map Projections & Coordinate Systems (67-94,97-104)
<b>WEEK 5</b> Oct 27-31	<b>Lecture: Remote Sensing</b>	<b>Lab 5: Remote Sensing</b> Introduction to ENVI • Image Processing DEM Processing • ASTER DTM	6-Aerial and Satellite Images 7-Digital Data
<b>WEEK 6</b> Nov 3-7	<i>(TO meeting)</i>	<b>Lab 6: Analysis</b> Spatial, Raster Terrain Analysis • Slope • Line of Sight • Viewshed • Profiles • Hillshade • Contours	9-Basic Spatial Analysis (295-335) 10-Topics in Raster Analysis (347-370) 11-Terrain Analysis
<b>WEEK 7</b> Nov 10-14	<b>Lab 7 :</b> ArcScene (3D Analyst)	<b>Lab 8:</b> Matlab	12-Spatial Estimation 13-Spatial Modeling
<b>WEEK 8</b> Nov 17-21	<b>Lab 9:</b> Scripts & Extensions (ArcGIS)	<b>Lab 10:</b> Velocity Vectors ArcScene Focal Mechanisms	14-Data Standards & Data Quality
<b>WEEK 9</b> Nov 24-28	Introduction to Google Earth	<i>Thanksgiving</i>	
<b>WEEK 10</b> Dec 1-5	<b>Final Projects Due</b> Should include: Rasters / DEM Images Processed / Rectified Vectors Existing Data w/ Spatial Analysis Created Data with Attributes Use of New Script or Extension		