Academic GIS courses at Cornell

Official Cornell courses dealing with GIS can be found in several departments across campus. Note that some of these courses focus entirely on GIS, while others may include GIS-related topics only as a portion of the total course content.

- **Spring 2019**
  - CEE 6150: Digital Image Processing
  - CRP 5080: Introduction to GIS for Planners
  - CRP 6290: Advanced Topics in GIS
  - PAM 6950: Spatial Demography
  - PLSCS 4200: Geographic Information Systems
  - PLSCS 4650: Global Navigation Satellite Systems
  - PLSCS 6200 / NTRES 6200: Spatial Modeling and Analysis

- **Fall 2018**
  - CEE 4110 / PLSCS 4110: Applied Remote Sensing and GIS for Resource Inventory and Analysis
  - CEE 6100 / PLSCS 6600: Remote Sensing Fundamentals
  - CRP 4080: Introduction to Geographic Information Systems (GIS)
  - CRP 5080: Introduction to GIS for Planners
  - DSOC 3140: Spatial Thinking, GIS, and Related Methods
  - EAS 2550: Observing the Earth: Remote Sensing and GIS
  - PLSCS 2200: Introduction to Mapping and Spatial Analysis with GIS

- **Other courses previously offered**
  - CLASS 5702: Geographic Information Systems for the Humanities and the Social Sciences
  - CLASS 6702: Geographic Information Systems Approaches to Ancient Landscapes
  - DSOC 5600 / CRP 5230: Analytical Mapping and Spatial Modeling
  - DSOC 7190: Advanced Regression and Spatial Statistics
  - EAS 3540/6540: Ocean Satellite Remote Sensing
  - EAS 5770 / ASTRO 6577: Planetary Surface Processes
  - GOVT 6524: GIS & Spatial Aspects of Politics
  - LA 6940: GIS for Landscape Architects
  - NTRES 6700: Spatial Statistics
  - PLSCS 6210: Applications of Space-Time Statistics

### Spring 2019

**CEE 6150: Digital Image Processing**

Spring. 3 credits. B. Philpot.

An introduction to digital image-processing concepts and techniques, with emphasis on remote-sensing applications. Topics include image acquisition, enhancement procedures, spatial and spectral feature extraction, and classification, with an introduction to hyperspectral data analysis. Assignments require the use of image-processing software and graphics. [Course website](#)

**CRP 5080: Introduction to GIS for Planners**

Fall or spring. 4 credits. Y. Xu.

This course is designed to provide students with a conceptual understanding of geographic information systems (GIS) and sciences, practical hands on experience with GIS software, and understanding of how GIS can be applied to planning practice and research. Students will be introduced to the basic concepts, structures, and functions of GIS as well as their applications and limitations. By the end of this course students should be familiar with a range of available tools and methods to address planning related problems and issues, and be able to conceive of and manage a GIS project. This involves a) identifying a planning analysis/research problem that requires GIS data and spatial analysis to address/analyze the problem; and b) collecting, processing, and analyzing spatial data to interpret the findings.

**CRP 6290: Advanced Topics in GIS**

Spring. 3 credits. S. Schmidt.
This course is designed to engage graduate level planning students in some more advanced topics using GIS methodology. Topics may vary from year to year, but in the past, the course has included an introduction to spatial statistics. Topics addressed include exploratory spatial data analysis, spatial autocorrelation, point pattern analysis, spatial interpolation techniques, spatial regression (including geographically weighted regression), and both spatial lag and spatial error models.

**PAM 6950: Spatial Demography**

Spring. 3 credits. P. Rich.

This course introduces core concepts and techniques for analyzing spatially referenced population data. Students will learn about the spatial structure of social phenomenon and how to analyze and/or account for spatial relationships in formal analyses. We will draw from examples in many substantive areas of demography, focusing on methods for describing and accounting for spatial relationships in statistical models. The course covers practical skills for managing and presenting spatial data using GIS software.

**PLSCS 4200: Geographic Information Systems**

Spring. 3 credits. Recommended prerequisite: PLSCS 2200 or previous experience with GIS, or permission of instructor. Y. Sun.

This course applies GIS data management and geospatial techniques to agronomic and natural environmental systems. The course is intended for undergraduate and graduate students interested in advancing their GIS knowledge with additional techniques and hands-on experiences in using GIS concepts/data/tools to address research questions in their interested fields of study.

**PLSCS 4650: Global Navigation Satellite Systems**

Spring. 1 credit. S. Smith.

Introduces navigation-grade GPS instruments used in agricultural and environmental science. Topics include instrument familiarization; field-data collection and processing; real-time and post-differential correction; and GPS-GIS integration and mapping of geo-positional data.

**PLSCS 6200 / NTRES 6200: Spatial Modeling and Analysis**

Spring. 3 credits. Prerequisites: PLSCS 4110, PLSCS 4200, or equivalent, or permission of instructor. D. Rossiter.

Theory and practice of applying geo-spatial data for resource inventory and analysis, biophysical process modeling, and land surveys. Emphasizes use and evaluation of spatial analytical methods applied to agronomic and environmental systems and processes. Laboratory section is used to process, analyze, and visualize geo-spatial data of interest to the student, ending in a comprehensive student project.

**Fall 2018**

**CEE 4110 / PLSCS 4110: Applied Remote Sensing and GIS for Resource Inventory and Analysis**

Fall. 3 credits. M. Laba.

Survey of geospatial data and information applied to the science of natural and environmental systems. Experiential approaches introduce basic concepts of photogrammetry and remote sensing and fundamental geospatial concepts such as scale and resolution. The course emphasizes the use and integration of maps, spatial databases, imagery, field data collection methodologies, accuracy assessment techniques and GPS to discriminate, measure, inventory and monitor resources. Course emphasizes the application of concepts and methodologies to student's own research data.

**CEE 6100 / PLSCS 6600: Remote Sensing Fundamentals**

Fall. 3 credits. B. Philpot.
Introduction to the principles, equipment, and methods used in obtaining information about earth resources and the environment from aircraft or satellite sensors. Topics include basic interactions of electromagnetic radiation with the earth, sensors, sensor and ground data acquisition, data analysis and interpretation, and project design in the form of a proposal to use remote sensing for a specific application.

**CRP 4080: Introduction to Geographic Information Systems (GIS)**

Fall or spring. 4 credits. Y. Xu.

Geographic Information Systems (GIS) have revolutionized the way we manage, analyze, and present spatial information. This course focuses on GIS in the social sciences. Many of the exercises and examples are based on planning issues, but the concepts can be applied to many other disciplines such as government, economics, natural resources, and sociology. Some of the issues covered include fundamentals of spatial analysis; overview of GIS technology and applications; designing a GIS project; gathering and analyzing data; and creating thematic maps.

**CRP 5080: Introduction to GIS for Planners**

Fall or spring. 4 credits. S. Schmidt.

This course is designed to provide students with a conceptual understanding of geographic information systems (GIS) and sciences, practical hands on experience with GIS software, and understanding of how GIS can be applied to planning practice and research. Students will be introduced to the basic concepts, structures, and functions of GIS as well as their applications and limitations. By the end of this course students should be familiar with a range of available tools and methods to address planning related problems and issues, and be able to conceive of and manage a GIS project. This involves a) identifying a planning analysis/research problem that requires GIS data and spatial analysis to address/analyze the problem; and b) collecting, processing, and analyzing spatial data to interpret the findings.

**DSOC 3140: Spatial Thinking, GIS, and Related Methods**

Fall. 4 credits. Letter grades only. J. Zinda.

Everything occurs in space. Knowing where organizations are located and events occur in space provides clues to understanding social order and processes not revealed by traditional social analysis techniques. At the same time, spatial thinking and methods are becoming increasingly used in the social sciences. The purpose of this course is to introduce the undergraduate to both aspects of spatial patterns, trends, and themes but also to methodologies for bringing spatial considerations into their research. The course provides a practical introduction to GIS via lab assignments.

**EAS 2550: Observing the Earth: Remote Sensing and GIS**

Fall. 3 credits. R. Lohman.

While the challenges facing society over the next decades are diverse and complex, the next generation of scientists can look forward to a steadily increasing family of space-based observations that will help inform decisions about the environment - both to highlight potential problems and gain the attention of decision-makers, and to illustrate the effects of attempts at mitigation so that we can redirect our efforts into the most useful avenues. In this course, we will explore the key questions facing our planet today, and the relevant data from current and future satellite missions. We will introduce students to Geographical Information Systems (GIS) and other methods for viewing and manipulating.

**PLSCS 2200: Introduction to Mapping and Spatial Analysis with GIS**

Fall. 3 credits. D. Sinton.

This class serves as an introduction to the principles of geographic information systems (GIS) and mapping to understand natural, social, and environmental issues. Students will develop competence and confidence at recognizing, interpreting, and applying GIS skills via maps and mapping. Emphasis will be on accessing, processing, visualizing, and analyzing geospatial data for communication and decision making. Throughout the class, students will gain experience in the fundamentals of GIS, organizing and managing geospatial data, and digital cartography. Students will use both desktop and online mapping software and applications.
Other courses previously offered

In addition to the above, the following courses have been offered in the past few semesters.

CLASS 5702: Geographic Information Systems for the Humanities and the Social Sciences
Spring 2016. 1 credit. G. Andreou.

The course will demonstrate how to implement, organize, and visualize spatial data for history, classics and archaeology. During the course, students will: (1) overview a range of spatial software (desktop and web-based), (2) create, query, and visualize geographic databases, (3) geo-reference historical maps (4) produce multilayer maps and share geographic data.

CLASS 6702: Geographic Information Systems Approaches to Ancient Landscapes
Spring 2018. 4 credits. G. Andreou.

This course will provide a theoretical grounding and practical experience with uses of Geographic Information Systems (GIS) for studying ancient landscapes. The course attends to the complexities of creating, managing and analyzing spatial data from archaeological surveys and excavations. Topics include critical discussions on how data are defined and how they relate to other data (ontology), as well as approaches to spatial data collection, (big data) management and analysis. During this course students will also overview a range of commercial and Open Source software through practical exercises. Students will finally apply insights gained by practicing analytical techniques to draw informed historical and archaeological conclusions.

DSOC 5600 / CRP 5230: Analytical Mapping and Spatial Modeling
Fall 2013. 4 credits. J. Francis.

The goal of this course is to introduce students in the social sciences and related fields to geographic information systems and spatial statistics as a set of tools to complement traditional analysis methods. Spatial relationships have become increasingly recognized as important in socioeconomic, political and demographic analysis. Recent research in these fields have demonstrated that understanding spatial relationships, in addition to other factors that account for differences and similarities between people and organizations, significantly increase our explanatory power. The first part of the course focuses on various features of GIS which are most useful to social scientists in their endeavors. The second part of the course introduces spatial statistics which further this understanding as well as control for spatial autocorrelation when it exists.

DSOC 7190: Advanced Regression and Spatial Statistics
Spring 2012. 4 credits. J. Francis.

This course will cover two topics, logistic regression and spatial linear regression. The course opens with a brief review of multiple regression theory and procedures. Then a little more than half the semester is devoted to logistic regression modeling. Spatial linear regression will be covered in five weeks of the semester. As both of these techniques are based on maximum likelihood procedures, some time will be devoted to an overview of maximum likelihood procedures.

EAS 3540/6540: Ocean Satellite Remote Sensing
Spring 2018. 3 credits. B. Monger.

The goal of the course is to teach participants the basic skills needed to work independently to acquire, analyze and visualize data sets derived from a variety of satellite sensors that provide global estimates of phytoplankton abundance, sea surface temperature ocean wind speeds, and geostrophic currents. An important feature of the course is to develop good Python programming skills that are needed to effectively analyze and visualize satellite data to answer important oceanographic questions. Background lectures will cover the fundamentals of bio-optics, phytoplankton pigment algorithms and, to a lesser extent, the underlying physical principals leading to the measurement of sea surface temperature, ocean wind speed and geostrophic currents. The 3-credit class is taught in an intensive format for 9 weeks with 150 minutes of lecture time and 4hr and 50min of computer lab time each week.
EAS 5770 / ASTRO 6577: Planetary Surface Processes

Spring 2017. 3 credits (4 credits if registered for lab trip). A. Hayes and M. Pritchard.

Survey of processes involved in the formation and evolution of the surfaces of solar system bodies. Surface morphology and landforms of terrestrial planets, planetary satellites, asteroids, and comets. Fundamentals of impact cratering, volcanism, tectonism, and erosion as applied to planetary surfaces, with significant emphasis on terrestrial field examples as analogs and study sites. Basic introduction to physical, geochemical, and "space" weathering of planetary surfaces. Basic introduction to field methods and remote sensing techniques and data sets (terrestrial, spacecraft). Students enrolled in the course can participate in an optional field trip over Spring Break to a "classic" planetary surface process analog field site (e.g., Meteor Crater, Amboy, White Sands, Hawaii, Grand Canyon, Death Valley) for 1 additional credit. Grading based on participation in discussions, critical literature reviews, and final project/presentation.

GOVT 6524: GIS & Spatial Aspects of Politics

Fall 2013. 4 credits. D. Patel.

This course will be a systematic study of the ways in which space structures political life. We will examine the politics of scale, boundaries within and between countries, size, and distance. We will discuss how political scientists are increasingly using spatial analysis in research. Students will learn Geographical Information Systems (GIS) and other techniques to capture, store, integrate, visualize, and analyze spatial data. The course, therefore, covers both methodology and substantive topics.

LA 6940: GIS for Landscape Architects

Spring 2014. 1-3 credits. J. Leijonhufvud.

NTRES 6700: Spatial Statistics

Spring 2018. 3 credits. P. Sullivan.

Develops and applies spatial statistical concepts and techniques to ecological and natural resource issues. Topics include visualizing spatial data and analysis and modeling of geostatistical, lattice, and spatial point processes. Applied analysis is carried out in the R statistical computing environment. PLSCS 6200 may be taken simultaneously.

PLSCS 6210: Applications of Space-Time Statistics

Spring 2017. 2 credits. Prerequisite: BTRY 6010 or equivalent. H. Van Es.

Introduction to space-time statistics with applications in agriculture and environmental management. Topics include geostatistics, temporal statistics, sampling, experimental design, state-space analysis, data mining, and fuzzy logic.