**University of North Carolina at Chapel Hill**

**Department of City and Regional Planning**

**PLAN 590 GIS Bootcamp**

Fall 2023

Fri 9:00 AM– 12:00 PM

New East 102

Lecturer: Yuhua Wang *yuhuaw@ad.unc.edu*

Office: 404 New East

Office Hour: Tue 3:00-5:00 pm or by appointment

 Course Learning Objective

No matter how large or small your community, planners, environmental scientists, public health officers, and other local analysts must deal with spatial information: addresses, land parcels and land cover, zoning, transportation networks, housing stock, neighborhoods, streams, and natural hazards. Federal, regional, state, county, and local planning agencies and private enterprises have realized the power of Geographic Information System (GIS) to identify problems, respond to them efficiently, and share the results with a variety of audience. GIS techniques provide tools to help you present and analyze spatial information.

This class covers a range of basic concepts of GIS and spatial analysis, covering three major processes in GIS application – data collection, data visualization, and data analysis. The course intends to provide broad coverage of GIS topics so that students will feel comfortable with the most basic functions of GIS and spatial analysis and will also be competent in using GIS software.

Note that this course is merely an introduction to GIS applications, those interested in a GIS-based career path should continue to take advanced GIS course and other programming course in Computer Science such as python, C++, SQL, etc.

This course consists of 5 weeks of labs to help you get familiar with GIS applications. In the class we will use ArcGIS Pro software, other alternatives like QGIS are much alike, with some functions labeling differently. By the end of the class, all students should be very familiar with core GIS application in ArcGIS Pro, which could be easily adapted to QGIS. This course also looks at how to make GIS useful to urban planners - this means that a large part of the class focuses on the tasks that urban planners will face in general.



**Course Topics and Reference Readings:**

**Week 1 – Course overview and Introduction to GIS**

Lecture

* Course overview
* Application of GIS in urban planning
* Defining GIS
* Basic knowledge of GIS Data Structure

Lab

* Get familiar with ArcGIS Pro
* Get hands on vector and raster data

Reference

* Esri. GIS Best Practices: GIS for Urban and Regional Planning.
* <https://www.esri.com/library/brochures/pdfs/gis-sols-for-urban-planning.pdf>

**Week 2 – Mapping Basics**

Lecture

* Map design
* Presenting data map
* Introduce Census and Tiger Data

Lab

* Making sense of Census

Reference

* Esri. Introduction to Map Design

**Week 3 – Geoprocessing**

Lecture

* Map projections and coordinate systems
* Basic geoprocessing tools
	+ Merge
	+ Clip
	+ Intersect

Lab

* Reconciling Tract and TAZ Boundaries

Assignment

* Tiny assignment – A review of previous class

Reference

* Esri. Jobs-housing balance, transit-oriented development, and commute time: Integrating GIS and GPS.

**Week 4 – Spatial Analysis**

Lecture

* Spatial Analysis tools
	+ Buffer
	+ Kernel Density
	+ Hot Spot analysis

Lab

* Exploring the spatial pattern and spatial relationship

**Week 5 – Extensions**

Lecture

* Data management in ArcGIS Pro
	+ Data conversion
* Other useful tools
	+ Spatial join

Lab

* Suitability analysis
* Choose one from below
	+ Network analysis – Design to new bus route in Chapel Hill
	+ Remote sensing analysis – Using nighttime light data to indicate economic development



**Grading**

The course is structured around a series of labs. The grade break down is shown below

|  |  |
| --- | --- |
| Lab 2 | 20% |
| Lab 3 | 20% |
| Lab 4  | 20% |
| Lab 5 | 40% |
| Total | 100% |

All labs are due by Fri 8:59 AM right before the next class.

Late assignments will not ordinarily be accepted. Grades of incomplete may be given in the event of a medical or other emergency. An application for an incomplete on any assignment, including the term project, must state the reasons for the request and propose a new deadline. A grade of F will be assigned for presentations and written assignments not completed on time. The University's Honor Code is in effect. Please consult with the instructor if you are uncertain about your responsibilities under that code with respect to this course. It will apply particularly for written work.



**OTHER Resources: Taking ESRI Virtual Campus Courses**

Virtual Campus is ESRI's on-line training center. Virtual Campus offers many training courses centered on learning GIS and using ESRI's GIS software packages, which you may want to take to supplement or expand on your GIS experience from this course. For more information, explore the Virtual Campus:

<http://campus.esri.com>

While the majority of the courses have an enrollment fee (typically $100), creating a member account is free, and there are several intro modules that can be taken free of charge. As part of the University Site License program, ESRI allows UNC unlimited access to seats at the ESRI Virtual Campus. This does not, however, apply to every course offered at the virtual campus. To see which courses are available free and how you can take them, see:

<http://its.unc.edu/gis/virtual_campus/>

**OTHER Resources: GIS LINKS**

* **National Spatial Data Infrastructure (NSDI)**

<http://www.fgdc.gov>

<http://nsdi.usgs.gov/>

[http://fgdclearhs.er.usgs.gov/ (FGDC Clearinghouse Referral Server)](http://fgdclearhs.er.usgs.gov)

[http://www.its.nbs.gov/nbs/meta/meta.html (Metadata Standard)](http://www.its.nbs.gov/nbs/meta/meta.html)

[http://www.fgdc.gov/framework/overview.html (NSDI Framework Initiative)](http://www.fgdc.gov/framework/overview.html)

* **Databases - National**

<http://www.census.gov/geo/www/tiger/>

ftp://ftp.census.gov/pub/tiger/boundary/

<http://www.wessex.com/>

<http://www.etak.com/>

* **Digital Line Graph (DLG)**

<http://edcwww.cr.usgs.gov/nsdi/gendlg.htm>

* **Digital Elevation Model (DEM)**

<http://edcwww.cr.usgs.gov/nsdi/gendem.htm>

* **Digital Orthophoto Quads (DOQ)**; **Digital aerial photography - rectified**

<http://nsdi.usgs.gov/nsdi/products/doq.html>

<http://mapping.usgs.gov/www/ti/DOQ/doqta.html>

<http://ortho.mit.edu>

* **Digital Raster Graphics (DRG)**; **Digital 7.5 minute maps**

<http://mapping.usgs.gov/nsdi/html/drg.html>

* **Land Use/Land Cover - Bureau of Land Management**

<http://edcwww.cr.usgs.gov/nsdi/digital2.htm>

[http://www.coresw.com/Databases/ (ImageNet Remote Sensing Data Info)](http://www.coresw.com/Databases)

<http://www.gislinx.com>

[http://www.esri.com/base/data/catalog/abk/abksam1.html (New Hampshire)](http://www.esri.com/base/data/catalog/abk/abksam1.html)

<http://plue.sedac.ciesin.org/plue/ddcarto> (Census data in ArcInfo, MapInfo and Atlas GIS format)

<http://www.cast.uark.edu/local/hunt/index.html> (US Geospatial Data and Attributes)

<http://www.epa.gov/docs/grd/forest_inventory/> (Forest Land Distribution Data from EPA)

<http://www.lib.virginia.edu/socsci/collections.html> (University of Virginia Social Science Data Center)

<http://www.ispa.fsu.edu/labins.html> (Land Boundary Information System)

<http://nsdi.usgs.gov/nsdi/> (US government data)

<http://edcwww.cr.usgs.gov/webglis> (USGS Global Land Information System)

* **Data - International**

<http://edcwww.cr.usgs.gov/webglis> (USGS Global Land Information System)

<http://ilm425.nlh.no/gis/dcw/dcw.html> (Digital Chart of the World and Data Quality Project)

[http://www.grida.no/prog/global/cgiar/htmls/data.htm](http://ilm425.nlh.no/gis/dcw/dcw.html) (UNEP/GRID - CGIAR Cooperation - Datasets)

<http://www.gcdis.usgcrp.gov/> (Global Change Data and Information System)

<http://res.agr.ca/CANSIS/_overview.html> (Canadian Soil Information System)

<http://www.grida.no/prog/polar/aedea/> (Arctic Environmental Database for Europe and Asia)

<http://ssda.anu.edu.au/ssda/about-ssda-holdings.html> (Social Science Data Archives - Australia)

<http://www.lib.berkeley.edu/ENVI/cityintl.html#data> (International Data and Statistics Sources)

<http://ellesmere.ccm.emr.ca/naismap/naismap.html> (National Map Atlas Information Servce - Canada)