

Plan 473
GIS for Community Planning

Fall 2017
M 9:00 – 11:45 AM
Saunders 116/112

Instructors: Suwan Shen
Assistant Professor
Urban and Regional Planning
suwans@hawaii.edu

Office Hours
Monday 2:30 pm- 3:30 pm
Wednesday 2:30pm – 3:30 pm
Saunders 107D

Teaching Assistant: Umeyo Momotaro
Office Hours: Tuesdays and Thursdays 2-3 pm
DURP GISLab (Saunders 112)

OVERVIEW

This course provides an introduction of geographic information systems (GIS) analysis techniques for spatial information management in community planning. Students will learn the basic concepts and principles, and practical skills of GIS through lectures, discussions, and labs.

Geographic Information System (GIS) is defined as (Wade and Sommer, 2006, p. 90): “an integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analyzed.”

GIS is widely used by planners as a planning information system. GIS can have many data layers that are made up of two kinds of information about each geographic feature – its geographical location and its description. The geographical location allows us to see the feature on a digital map based on its actual position. The description of a feature is known as its attribute, which is stored in table as a database file. A digital map could have many attributes explaining the condition of that particular area. GIS is able to give more accurate and faster answers to critical questions about the location, nature, rate, amount and type of geographical data change taking place in the community. Kaiser et.al, (1995, p. 89) describe the importance of information system in planning: “the planning information system is a foundation of planning intelligence as a strategic decision-support information that enables the planner and the community to

identify, understand, and deal with new and trying situations, which often appear as messes until they are systematically sorted out.”

The map is a universal language and a powerful tool in describing spatial information. Geographic Information System (GIS) is a relatively new field which was invented and developed in the 1960s. The GIS has capabilities to generate different maps from a single database depending upon its purpose. With its capability for spatial analysis, the use of this system has steadily increased (Mark, et.al, 1996). Government agencies, private companies, the military, and even individuals use this system to analyze spatial data. The use of GIS for community-based planning is a fairly recent phenomenon that has spurred on by a range of economic, social, and political factors (Ramasubramanian, et.al, 2001). This GIS application extends from the integration of narratives and local knowledge with current GIS software, to multimedia GIS, the design of collaborative decision support systems, and the use of non-hierarchical systems of information flow (Leitner, et.al, 1998). This method allows feedback to be compiled in a short time and can be seen by the participants soon after they have finished submitting their voice. It also allows a two-way flow of information and data between the users and the client. This two-way flow opens up many possibilities for participatory planning. However, it is important to realize that the main task of using GIS application is not to capture or replicate all the information, but to organize and present pertinent information that was not previously available, and to assist the community in their decision making. Information screening should be done by involving stakeholders and incorporating their knowledge in the decision making process (Gavin 1998).

COURSE DESCRIPTIONS AND OBJECTIVES

This course will be a combination of a lecture and lab work. The lecture/discussion period will cover:

- theory, concepts, methodology, application of spatial analysis and GIS,
- discussion on participatory planning and techniques to integrate public inputs into the GIS environment, and
- discussion on readings and assignments.

The lab period of the course will introduce students to a variety of tools available in the GIS software that can be used to help planners in handling various planning problems. It also covers the actual process in converting various types of data and inputs into GIS environment. Students are encouraged to spend time outside of the normal lab hours getting to know the software tools. Remember, this course is not intended to be cookbook type course to teach students how to press buttons on the GIS, but rather focus on the reason why someone would use spatial methods. An important aspect of the course is to gain hands-on experience in applying GIS and spatial analytical techniques to address research questions. The main goals of the class are:

- introduce GIS as a planning tool;
- understand basic GIS concepts and terminology;
- provide understanding of essential methodological and practical issues that are involved in carrying out spatial analyses using GIS;

- use ArcGIS tools and methods to streamline various types of data and inputs for decision making including exploring, creating, editing and analyzing spatial data; and,
- design maps in ArcMap that incorporates basic map elements.

SOFTWARE

ArcGIS 10.2.2 - Geographic Information System. This software is installed on each PC machine in the Department of Urban and Regional Planning GISLAB (Saunders Hall Rm. 112). There are 24 PC based machines available, and each student is encouraged to use the same machine throughout the semester.

Student version of ArcGIS (one-year education use only) software will be provided free of cost to those students who plan to install the ArcGIS 10.2.2 software in her/his PC based machine, make sure that your pc meets the following minimum requirements:

HARDWARE:

- CPU speed 2.2 Ghz dual core or higher
- Memory 2 GB or higher
- Disk space minimum 2.4GB with another 500MB for swap space
- Video adapter with 24 bit graphic accelerator capability and at least 64 MB of video memory, 256 MB of video RAM or higher recommended

SOFTWARE:

It is recommended that you have a Windows based pc system with following software:

- Windows XP (Professional or Home Edition) SP3 for 32-bit, or SP2 for 64-bit, or
- Windows Vista (Ultimate, Enterprise, Business, Home Premium) SP2, 32-bit or 64-bit, or
- Windows 7 (Ultimate, Enterprise, Professional, Home Premium) SP1, 32-bit or 64-bit
- Windows 8 (Basic, Professional and Enterprise) 32 bit and 64 bit
- Windows 8.1 (Basic, Pro and Enterprise) 32 bit and 64 bit
- .NET Framework 3.5 SP1, which must be installed before installing ArcGIS
- Microsoft Internet Explorer 7.0 or 8.0 for installation process

Detailed information on system requirements can be found at:

<http://resources.arcgis.com/en/help/system-requirements/10.2/index.html>

While it is possible to run ArcGIS in Intel based Mac system using virtualization programs (VMware Fusion, Parallels) or using the “BootCamp” method, the result is often not very satisfactory. Refer to the following articles for details if you intend to use Mac: <http://blogs.esri.com/esri/gisedcom/2007/09/05/arcgis-on-a-mac/>
<http://www.uic.edu/cuppa/udv/GIS/ArcGISonMac200911.pdf>

PREREQUISITES

No prior knowledge of GIS is required to take this course. Nonetheless, to be able to follow this fast moving and relatively technologically advanced course, there are some prerequisites:

- Familiarity with the PC based operating system (Windows XP, Vista Windows 7 or 8), including the file management (copying, moving, creating and locating files and folder, etc.) using windows explorer.
- Familiarity with data management routine (data entry, editing, sorting, transposing, converting text to number, calculating using simple formulas, etc.) using Microsoft Excel or similar spreadsheet programs.
- Strong motivation to explore computer applications.
- Willingness to think outside of the box.

REQUIRED READINGS AND MATERIALS

1. The GIS 20: Essential Skills, by Gina Clemmer
Paperback: 204 pages
Publisher: ESRI Press, 2nd edition (August 29, 2013)
ISBN-13: 9781589483224
2. Weekly reading materials
3. Weekly GIS Lab modules

Beside them, these books are optional but highly recommended:

Getting to Know ArcGIS Desktop, by Michael Law and Amy Collins.
Paperback: 794 pages
Publisher: ESRI Press; Forth Edition, for ArcGIS 10.2 Third edition (2015)
ISBN-13: 1589483820

Maribeth H. Price. (2016). Mastering ArcGIS (7TH Ed.). McGraw Hill. New York. ISBN: 978-0-07-809514-6

Students are encouraged to actively participate in the class discussions, which will cover reading materials on public participation and possible tools in ArcGIS to be used to tackle related planning issues. Students are required to complete lab assignment that will be handed after the lab. The assignments are designed to enhanced students' skills that they received during the lab exercise. Each student should submit her/his own work. Copying other's work is not acceptable. Students are also required to collect data from the community as class assignments. The assignment is an individual task and should be submitted by the due date. It is important for students to submit the lab exercise on time. Collected data will be grouped and used in the lab exercise. Late submission is not appreciated. Each 24 hours of late submission will penalize the grade by 25%.

Students will complete a GIS project. Students should form a group of 2 (only one group will have 3 members if we have an odd number of students). Group should be formed by **Oct 23** (Class 9), and project proposal should be submitted by **Oct 30** (Class 10) of this course. Proposal should be around 1-2 pages long (8.5" x 11"), typed using 12 point Times New Romans font or equivalent, in 1.5 line spacing format, and with 1 inch margins. It should cover background, problems or research question(s) that would be

answered, tools in ArcGIS that would be used, and expected outputs. Students are encouraged to discuss the project closely with the instructor.

Each group is expected to do a powerpoint presentation at the end of course period. The presentation should include brief explanation on the problem(s), GIS techniques used, findings, and conclusions. Use of tables and maps are more preferable in explaining group's findings. Beside the presentation, each group is also required to submit a final report describing the urban and regional planning issue as the background, literature review, research question(s), GIS and other techniques used to answer the question(s), findings, and conclusions. GIS methodology and products (i.e. maps) should be used as the main tool in answering the issue. Final report, which is due a week after presentation, should be not more than 12 pages long (8.5" x 11") but not less than 6 pages, typed using 12 point Times New Romans font or equivalent, in 1.5 line spacing format, and use 1 inch margins. Helpful tools and resources for writing can be found at University of Hawai'i, Writing Center webpage (<https://sites.google.com/a/hawaii.edu/writingcenter/resources>). For Citations (APA or MLA Style): <http://www.lib.ncsu.edu/citationbuilder/>.

It is each student's responsibility to learn about plagiarism and how to avoid it. The following definition of plagiarism comes from The University of Hawaii System wide Student Conduct Code (page 9):

The term "plagiarism" includes, but is not limited to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgement. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

For the entire Student Conduct Code, see:

http://studentaffairs.manoa.hawaii.edu/downloads/conduct_code/UHM_Student_Conduct_Code.pdf

GRADING POLICY

Grade for this course is determined by several factors:

Class and Lab Participation:	5%
Assignments & Quiz:	
Lab assignments	36%
Class assignments	10%
Project Proposal:	9%
Group Final Project:	
Presentation	10%
Final report	30%

GRADE ALLOCATION

<u>Points</u>	<u>Grade</u>	<u>Points</u>	<u>Grade</u>
97-100 points	A+	77-79.9 points	C+

94-96.9 points	A	74-76.9 points	C
90-93.9 points	A-	70-73.9 points	C-
87-89.9 points	B+	67-69.9-points	D+
84-86.9 points	B	64-66.9 points	D
80-83.9 points	B-	60-63.9 points	D
		Less than 60 points	F

SOME USEFUL WEBSITES

The National Center for Geographic Information and Analysis

(<http://www.ncgia.ucsb.edu/>)

Honolulu Land Information System (HoLIS) from the City and County of Honolulu

(<http://gis.hicentral.com>)

Honolulu Open Geospatial Data Website (<http://cchnl.maps.arcgis.com/home/>)

Hawaii State GIS Program (<http://hawaii.gov/dbedt/gis/>)

The US Census Bureau Topologically Integrated Geographic Encoding and Referencing system (TIGER) (<http://www.census.gov/geo/www/tiger/>)

US Geological Survey (USGS) (<http://www.usgs.gov/pubprod/>)

UH Manoa Library (<http://magis.manoa.hawaii.edu/gis/training.html>)

GeoCommunity (<http://www.geocomm.com/>)

Integrated Approaches to Participatory Development (IAPAD) (<http://www.iapad.org/>)

ESRI online GIS Dictionary

(<http://support.esri.com/index.cfm?fa=knowledgebase.gisDictionary.gateway>)

SCHEDULE

Lecture Subject	Lab Subject
Class 1 – August 21	
<ul style="list-style-type: none"> • Introduction • Course and syllabus review • GIS and Geospatial revolution Geospatial Revolution video http://www.youtube.com/watch?v=poMGRbfgp38 GIS ESRI video http://www.youtube.com/watch?v=kEaMzPo1Q7Q	Module: GIS LAB Management <ul style="list-style-type: none"> • GIS LAB Management • Launching ArcGIS 10.2.2 • Getting to know the ArcGIS Components Reference: Clemmer (2013) Introduction, Ch.1
Class 2 – August 28	
<ul style="list-style-type: none"> • Introduction to Public Participation GIS (PPGIS). Video: Mapping Power to the People http://www.youtube.com/watch?v=ChWj4yBmE0E Reading: <ul style="list-style-type: none"> • Harvey, F. 2008. <i>Chapter 1, Goals of Cartography and GI: Representation and Communication</i>. A primer of GIS: fundamental geographic and cartographic concepts. New York: Guilford Press. • What is PPGIS? • Jon Corbett et al. 2010. <i>Participatory mapping and communication: A guide to developing a participatory communication strategy to support participatory mapping</i>. IFAD http://www.ifad.org/pub/map/pm_iii.pdf Assignment: Identifying 15 key sites around Manoa campus. Due on September 11 (Monday), 2017 at 9:00 am (submit via laulima).	Module: Getting to Know to ArcGIS 10.2.2 <ul style="list-style-type: none"> • Working with Shapefile • Adding a Map • Using Tools in the Toolbar • Changing Feature Properties • Modifying a Feature Symbology • Modifying a Feature Properties • Layer’s Menu • Saving ArcMap Document Reference: Clemmer (2013) Introduction, Ch. 1 & 6
September 4 – Labor Day	
Assignment: Identifying 15 key sites around Manoa campus. Due on September 11 (Monday), 2017 at 9:00 am (submit via laulima).	
Class 3 – September 11	
<ul style="list-style-type: none"> • Participatory mapping tools. 	Module: Getting to Know to ArcGIS 10.2.2

<p>Reading:</p> <ul style="list-style-type: none"> • Jon Corbett. 2009. Good Practices in Participatory Mapping. International Fund for Agricultural Development (IFAD), Rome, Italy http://www.ifad.org/pub/map/pm_web.pdf • Kingston, R. (et.al). 2000. Web-based public participation geographical information systems: an aid to local environmental decision-making. <i>Computers, Environment and Urban Systems</i>. 24. 109-125. 	<ul style="list-style-type: none"> • Feature Selection by Polygon • Feature Selection by Location • Editing Attribute Tables • Create a Shapefile of Selected Attributes • Using ArcCatalog • Saving ArcMap Document <p>Reference: Clemmer (2013) Introduction, Ch. 7, 12, 13 & 20</p>
Class 4 – September 18	
<ul style="list-style-type: none"> • Scale and projection system. • Metadata. <p>Video: West Wing - Why are we changing maps? https://www.youtube.com/watch?v=eLqC3FNNOaI</p> <p>Reading:</p> <ul style="list-style-type: none"> • Frye, C. 2001. Making Maps That Communicate. <i>ArcUser</i>, October-December 2001. • ESRI. 2004. <i>Understanding Map Projections</i>. ESRI Press: Redlands, CA. 	<p>Module: Getting to Know to ArcGIS 10.2.2</p> <ul style="list-style-type: none"> • Defining the Coordinate System and Datum • Changing the Coordinate System and Datum • Download Shapefile from Website • Joining Tables <p>Reference: Clemmer (2013) Introduction, Ch. 3 & 5</p>
Class 5 – September 25	
<ul style="list-style-type: none"> • Geocoding and georeferencing image • Sense of Community Map • Movie: Wuhu Community Map (Participatory Video - English), http://www.youtube.com/watch?v=Vfk2W-FYIIM&feature=related <p>Reading:</p> <ul style="list-style-type: none"> • Nigel Crawhall. 2010. <i>The Role of participatory cultural mapping in promoting intercultural dialogue: We are not hyenas</i>; a reflection paper. UNESCO; 27 p., illus. • The Land Information Access Association. 1999. <i>Building a Sense of Place</i>. • Rumsey, D., & Williams, M. (2002). <i>Historical maps in GIS</i> (pp. pp-1). na. <p>Assignment: Sense of Community Maps. Due on Oct 9 (Monday), 2017 at 9:00 am.</p>	<p>Module: Getting to Know to ArcGIS 10.2.2</p> <ul style="list-style-type: none"> • Work on Surveyed Data • Creating an Address Locator • Geocoding • Registering Images in ArcGIS <p>Reference: Clemmer (2013) Introduction, Ch. 4, 8 & 17</p>

(upload scanned or picture version via laulima)	
Class 6 – October 2	
<ul style="list-style-type: none"> • Community mapping process. <p>Reading:</p> <ul style="list-style-type: none"> • Knapp C.L. 2003. <i>Making Community Connections, The Orton Family Foundation Community Mapping Program</i>. ESRI Press: Redlands, CA. Part I and VI. • Sletto, B.I. 2009. “We Drew What We Imagined” Participatory Mapping, Performance, and the Arts of Landscape Making. <i>Current Anthropology</i>. Vol. 50, No. 4. 443-476. 	<p>Module: Getting to Know to ArcGIS 10.2.2</p> <ul style="list-style-type: none"> • Working with Raster Grid Data – USGS Digital Elevation Models (DEM) • Changing Projection of Raster File • Working using Different Data Frame • Converting the Raster Calculator • Converting the inundation area (Raster) to a shapefile • Combining Georeferenced Images • Creating an Empty Shapefile • Clipping Function • Masking Function <p>Reference: Clemmer (2013) Introduction, Ch. 2, 6, 9, 11 & Bonus chapter 7</p>
Class 7 – October 9	
<ul style="list-style-type: none"> • Limitation in community GIS mapping process. <p>Reading:</p> <ul style="list-style-type: none"> • Al-Kodmany, Kheir. 2000. Extending Geographic Information Systems to Meet Neighborhood Planning Needs: The Case of Three Chicago Communities. <i>URISA Journal</i>, 12 (3), 19-37. • Robert Chambers. 2006. Participatory Mapping and Geographic Information Systems: Whose Map? Who is Empowered and Who Disempowered? Who Gains and Who Loses? <i>EJISDC</i>, 25, 2. 1-11 	<p>Module: Getting to Know to ArcGIS 10.2.2</p> <ul style="list-style-type: none"> • Creating Buffer • Plotting the Community Map • Plotting the Key Sites of Community Map <p>Reference: Clemmer (2013) Introduction, Ch. 11 & 14</p>
Class 8 – October 16	
<ul style="list-style-type: none"> • Visiting MAGIS facility at Hamilton Library. Meet in front of library at 8:45 am. 	
Class 9 – October 23	

<ul style="list-style-type: none"> • Applications <p>Readings:</p> <ul style="list-style-type: none"> • Kim, K., Burnett, K., & Ghimire, J. (2015). Assessing the potential for food and energy self-sufficiency on the island of Kauai, Hawaii. <i>Food Policy</i>, 54, 44-51. • Brown, G., & Raymond, C. M. (2014). Methods for identifying land use conflict potential using participatory mapping. <i>Landscape and Urban Planning</i>, 122, 196-208. <p>Group should be formed for final project</p>	<p>Module: Getting to Know to ArcGIS 10.2.2</p> <ul style="list-style-type: none"> • Combining Plotted Maps using Append Tool • Combining Plotted Maps using Merge Tool • Eliminating Identical Records • Dissolving Records • Spatial Joins • Creating Reports • Statistical Analysis <p>Reference: Clemmer (2013) Introduction, Ch. 11, 16 & 18</p>
Class 10 – October 30	
<ul style="list-style-type: none"> • Suitability analysis • Group consensus <p>Reading:</p> <ul style="list-style-type: none"> • Uy, P. D., & Nakagoshi, N. (2008). Application of land suitability analysis and landscape ecology to urban greenspace planning in Hanoi, Vietnam. <i>Urban Forestry & Urban Greening</i>, 7(1), 25-40. • Polat, E. (2011). An Approach for Land-Use Suitability Assessment Using Decision Support Systems, AHP and GIS. <i>Green and Ecological Technologies for Urban Planning: Creating Smart Cities: Creating Smart Cities</i>, 212. <p>PROJECT PROPOSAL DUE (Upload proposal to laulima assignment before class)</p>	<p>Module: Suitability Analysis Using Vector Data</p>
Class 11 – November 6	
<ul style="list-style-type: none"> • Suitability analysis using vector vs. raster map. <p>Reading:</p> <ul style="list-style-type: none"> • Eastman, J.R., W. Jin, P.A.K Kyem, and J. Toledano. 1995. Raster procedures for 	<p>Module: Suitability Analysis Using Raster Data and Model Builder</p> <p>Reference: Ormsby (2010) Section 8</p>

<p>multi-criteria/multi-objective decisions. <i>Photogrammetric Engineering & Remote Sensing</i>. Vol. 61, No. 5. 539-547.</p> <ul style="list-style-type: none"> • Dai, F. C., Lee, C. F., & Zhang, X. H. (2001). GIS-based geo-environmental evaluation for urban land-use planning: a case study. <i>Engineering geology</i>, 61(4), 257-271. 	
Class 12 – November 13	
<ul style="list-style-type: none"> • Network analysis <p>Reading:</p> <ul style="list-style-type: none"> • Shen, S., Feng, X., & Peng, Z. R. (2016). A framework to analyze vulnerability of critical infrastructure to climate change: the case of a coastal community in Florida. <i>Natural Hazards</i>, 84(1), 589-609. • Kim, K., Pant, P. Yamashita, E., Ghimire, J., Brunner, I. M. (2012). The Spatial Criticality of Transportation Risks from Sea Level Rise, Storm Surge and Tsunami Hazards in Honolulu. <i>Paper presented in The Transport Research Board (TRB) 92nd Annual Meeting</i>, Jan 13-17, 2013, Washington D.C 	<p>Module: Network Analysis</p> <ul style="list-style-type: none"> • Shortest path from point to point with and without obstacle <p>Reference: ArcGIS Network Analyst Tutorial http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#//00470000005r000000.htm</p>
Class 13 – November 20	
<ul style="list-style-type: none"> • Disaster Risk Management <p>Reading:</p> <ul style="list-style-type: none"> • Peters G., M.K. McCall, C. van Westen. (2009). Coping Strategies and Manageability: How Participatory Geographical Information Systems Can Transform Local Knowledge into Better Policies for Disaster Risk Management. <i>International Institute for Geo-Information Science and Earth Observation (ITC); Disaster Studies Working Paper 22</i>; Aon Benfield UCL Hazard Research Centre https://www.ucl.ac.uk/hazardcentre/resources/working_papers/working_papers_folder/wp22 • Briggs, D.J. et.al. (1997). Mapping urban air pollution using GIS: a regression-based approach. <i>Int. J. Geographical Information Science</i>. Vol. 11, No. 7. 699-718. • Shen, S., Deng, Y.J., & Peng, Z.R. UF Sea level rise vulnerability viewer. http://plaza.ufl.edu/dengyujun11/SLR7.0.html 	<p>Module: Analyzing Ground Level Radiation from the Fukushima Nuclear Power Plants</p> <p>Reference: An overview of the Interpolation toolset http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/An_overview_of_the_Interpolation_tools/009z00000069000000/</p>
Class 14 – November 27	
WORK ON FINAL PROJECT	WORK ON FINAL PROJECT

Class 15 – December 4	
WORK ON FINAL PROJECT	WORK ON FINAL PROJECT
Class 16 – December 8 (Friday) Final Presentation	
December 14 (Thursday), 4:00 PM– Final Paper Due	

References

- Gavin, J. (1998). A public participation GIS for community forestry user groups in Nepal: Putting people before the technology. Retrieved from: <http://www.ncgia.ucsb.edu/varenius/ppgis/papers/jordan.pdf>
- Kaiser, E.J., Godschalk, D.R., & Chapin, F.S. Jr. (1995). Urban land use planning (4th ed.). Urbana: University of Illinois Press.
- Leitner, H., McMaster, R., Elwood, S., McMaster, S., & Sheppard, E. (1998). Models for making GIS available to community organizations: Dimensions of difference and appropriateness. Retrieved from: <http://www.ncgia.ucsb.edu/varenius/ppgis/papers/leitner.pdf>
- Mark, D., Chrisman, N., Frank, A., McHaffie, P., & Pickles, J. (1996). The GIS history project.
- Ramasubramanian, L., Huxhold, B., Albrecht, J., & Ajirotutu, C. (2001). Analyzing urban indicators using GIS: Building local capacity in developing countries through participatory research. In the: 7th International Computers in Urban Planning and Urban Management Conference July 18 - 20, 2001. Honolulu: University of Hawaii at Manoa.
- Wade, T., Sommer, S. (2006). A to Z GIS: an illustrated dictionary of geographic information system. Redland, CA: ESRI