SSCI 581 – Concepts for Spatial Thinking (Section 35744D)
Course Syllabus – Fall Semester 2014

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Office Hours: Monday and Wednesday, 9:00-10:00 a.m. PT
I am always available asynchronously via email. I am also available for synchronous chats via phone, audio or video most days and times *by prior arrangement* via email. Or we can meet in my Adobe Connect room. Just get in touch!

Course Scope and Purpose

This course is designed as an introduction to geographic information science, and more importantly, to the cartographic and spatial concepts underlying spatial thinking and the associated geospatial technologies. It is the entrée course for both the GIST M.S. and Graduate Certificate programs. This is also a good course for those who are considering getting more seriously involved with GIS and who wish to first understand the underlying concepts. In this course, you will gain an understanding of the fundamentals of geographic information science, including geodesy, the evolving role of maps in science, policy and our everyday lives, and the ways in which various forms of spatial analysis, modeling and visualization can be performed using Esri's ArcGIS ecosystem. We will cover five major topics:

Spatial thinking – We will start by exploring why spatial thinking is important for describing, analyzing, modeling and visualizing our world and how the "habit" of spatial thinking can be encouraged and cultivated among working professionals, citizens and most of all, students of all ages. We will use a series of readings and case studies to show how spatial thinking permeates and supports various kinds of problem solving.

Geodesy – We will next turn our attention to geodesy, which is the branch of science most concerned with positioning and determining what is where on Earth. The major topics to be covered – geodetic datums, geoids, coordinate systems, and map projections – are fundamental building blocks for all that follows in our online courses and programs and of course, in the successful deployment and use of geospatial technologies.

Fundamentals of GIS – We will explore the evolving field of geographic information science and the relationships between this and other disciplines or fields spread across the natural and social sciences, the humanities, engineering and the applied sciences, and the professions (architecture, health, journalism and social work, among others).

The ArcGIS Ecosystem – We will also begin to explore how the ArcGIS software ecosystem can be used to represent the world around us using a series of tutorials that cover the various forms of geospatial data, the raster and vector data models, coordinate systems and map projections, and selected forms of geographic analysis, including georeferencing, network and raster analysis.

Maps – Maps have been used for hundreds and possibly thousands of years to compile and communicate geographic concepts and relationships. Once the more or less exclusive domain of professional cartographers, maps can be authored and shared in new and

wonderful ways using GIS and the Web. We will review past, present and future uses of maps and how these can be generated and used to depict and communicate geographic knowledge in a digital age.

Learning Outcomes

When you have completed this course, you will be able to:

- Explain the role and importance of geodesy and how the various components – geodetic datums, geoids, coordinate systems, and map projections – can be used to position and locate things (i.e. places, people, features) on the Earth's surface.
- Specify how the various elements of spatial thinking can enable us to identify, describe, analyze and visualize spatial phenomena.
- Define the fundamental spatial concepts and terms such as arrangement, orientation, diffusion, dispersion and pattern.
- Explain cartographic excellence and how maps and geographic understanding have been used throughout history to organize and empower different groups of people.
- Speculate on how maps might be used by various people in the next few decades.
- Describe one or more compelling applications of spatial thinking and why these kinds of workflows and/or solutions are important.
- Specify how the spatial analysis, modeling, and visualization tools included in geographic information systems and other geospatial technologies might be used to advance knowledge creation and communication across a variety of disciplines.

Course Formats

This is a graduate level course, so you should expect this class to be both academically robust and intellectually challenging. As graduate students you are expected to engage with the information you are learning and to explore the heady cauldron of ideas, opinion, and analysis that describe our collective effort to thoroughly interrogate the subject at hand. Learning arises from active engagement with the knowledge found in our reading materials and with one another. As in any graduate class, the instructor's role is that of a guide who keeps you on this path of discovery and you will find that you will learn much from your fellow classmates. The challenge for us is to replicate such an academic experience within the milieu of "online learning".

All course materials will be organized through Blackboard. The main theoretical concepts will be provided through course notes and assigned readings. Written assignments will give students an opportunity to internalize and apply the concepts and theory learned from readings. Some assignments require student interaction, all will benefit from it. Hands-on practical exercises will mainly use ArcGIS version 10.2.1, which is accessible via the GIST Servers.

We have several technologies that will facilitate our course work and our interactions, despite our dispersed locations. These include:

Blackboard – All course materials and correspondence will be posted on the course Blackboard site. As a registered student, you will find this course will show up in your available classes no later than 12:00 noon, PT on the first day of classes. It is here that the day-to-day flow of the course will be recorded.

Discussion boards – On the Blackboard site, we will post a number of discussion threads related to

various course topics. These threads are very important in terms of providing support to each other while working on class exercises to share hints and helpful tips, as you would do in a classroom setting. I will check the discussion threads periodically and offer occasional comments. Please send me an email directly if you have a question or concern that requires my immediate attention.

Live meetings and presentations – We will use a browser-based service called Adobe Connect to create synchronous, interactive sessions. With voice and webcam capabilities, Adobe Connect can be used to share presentations and even our desktops between two or more people.

Individual meetings – While Adobe Connect can be used for one-on-one meetings, we generally find it easier to use the free VOIP and chat technology, Skype (http://www.skype.com/) for individual chats.

GIST server and tech support – This course will utilize the GIST Servers to provide you with your own virtual desktop. You can access the GIST Server at: https://gistonline.usc.edu. If you are unable to connect to the server or experience any type of technical issues, send an email to GIST Tech Support at gistsupport@dornsife.usc.edu and make sure to copy (cc) me on the email. GIST Tech Support is available Monday through Friday, 9:00 a.m.to 5:00 p.m. PT.

Assessments

Your grade in this class will be determined on the basis of several different assessment tools:

Resume Assignment – 1 for a total of 2 points. The GIST Programs require all current students to post and maintain a public resume, short biography and recent photo on our shared GIST Student Community Blackboard site. With your permission, your photo and resume will be posted to the Spatial Sciences Institute website and your resume will be included in the GIST Resume Book. The latter is compiled annually and, along with our web presence, is used to promote our programs and more importantly, your skills, experience, and professional aspirations.

Written Assignments – 5 for a total of 15 points. Each student is required to complete five written assignments for this class. These assignments will focus on the theory portion of the course as presented in weekly readings. The objective is to help you evaluate and integrate the information you have acquired from the course readings. Some of these will involve discussions and collaborative work, some will be individual efforts. The first and fifth written assignments are required; otherwise, you are free to choose any three from the remaining nine assignments but you must complete and submit them for grading in the weeks specified at the end of this syllabus. If you complete more than five reading assignments, I will use your highest three scores for the nine assignments to calculate your course grade.

Discussion Forums – 5 for a total of 10 points. These will focus on varying combinations of theory and practice and anticipate that you will post a minimum of five new messages (i.e. one per forum) and 10 replies to messages posted by your classmates (i.e. two per forum) at designated times throughout the semester.

Geodesy Quiz – 1 for a total of 8 points. One quiz will be administered towards the end of Week 6 and will afford each of you the opportunity to demonstrate your knowledge and understanding of geodetic datums, coordinate systems, and map projections.

ArcGIS Tutorials – 10 for a total of 30 points. Most weeks you will be expected to work through one chapter in Price's *Mastering ArcGIS* workbook. To demonstrate that you have completed each chapter, you will turn in brief text answers and/or a copy of some digital output from the final part of the exercise such as a map. In addition, you will be expected to offer each other advice and assistance on tutorials through Blackboard.

Final Project – 4 components for a total of 35 points. The final project will be your opportunity to integrate all that you have learned in the semester by framing a site suitability question, collecting the appropriate spatial and non-spatial data, importing the data into ArcGIS, producing and interpreting a series of maps that represent geographic phenomena related to your site suitability analysis, and indicating how you would proceed if you were to complete the site suitability analysis and what you anticipate would be the final results. To help facilitate this work, the final project will be broken up into four distinct components with their own points and deadlines as follows: (1) a single paragraph (300 word maximum) that describes the site suitability question and one or more tables summarizing criteria for your site suitability analysis (6 points); (2) an individual meeting for you to present and discuss your proposal and the various ways you might modify it (3 points); (3) a data report documenting the data you have identified and acquired for your project (6 points); and (4) the final report itself which must not exceed 10-12 single-spaced and typed pages plus figures, maps, tables and references and will count 20 points towards your final grade for the course.

Careful planning and a serious, consistent commitment will be required for you to successfully navigate the various deliverables in this and other GIST courses. The table below summarizes the SSCI 581 course assignments and their point distribution:

Assignments	Number	Points Per Assignment	Total Points
Discussion forums	5	2	10
Geodesy quiz	1	8	8
GIS tutorials	10	3	30
Resume assignment	1	2	2
Written assignments	5	3	15
Final Project:			
Proposal	1	6	6
Meeting	1	3	3
Data report	1	6	6
Final report	1	20	20
Totals	**26**	**-**	**100**

Grades in this and other GIST courses will use the standard USC grading criteria, as follows:

A ≥ 93 points	B- 80-82 points	D+ 67-69 points
A- 90-92 points	C+ 77-79 points	D 63-66 points
B+ 87-89 points	C 73-76 points	D- 60-62 points
B 83-86 points	C- 70-72 points	F < 60 points

And finally, it is important to note from the outset that: (1) late postings and assignments will be docked one grade and no grade will be given for postings or assignments turned in more than one week late; and (2) no written work will be accepted for grading after 5:00 p.m. PT on the last day of classes (i.e. 12/5/14).

Requirements

Textbooks – There are five required texts for this course. We encourage you to purchase the first and the fourth of these books early since you will need these materials from the opening day of class. They are available from the USC Bookstore or online outlets such as Amazon. Please note that the NRC Report can be downloaded free-of-charge from the web and that a pdf file of the second chapter of the Mitchell text will be posted on Blackboard, and the Wilson and Fotheringham book is available through the USC Libraries as an e-Book.

- Bolstad, P. 2012. *GIS Fundamentals: A First Text on Geographic Information Systems,* 4th Edition. White Bear Lake, MN: Eider Press (available at http://www.AtlasBooks.com).
- Mitchell, A. 2012. *The Esri Guide to GIS Analysis Volume 3: Modeling Suitability, Movement, and Interaction,* Redlands, CA: Esri Press.
- National Research Council, 2006. *Learning to Think Spatially*. Washington, DC: National Academies Press (available at http://www.nap.edu/catalog.php?record_id=11019).
- Price, M. 2013. *Mastering ArcGIS,* 6th Edition. New York, McGraw-Hill.
- Wilson, J. P. and A. S. Fotheringham (editors). 2008, *The Handbook of Geographic Information Science.* Oxford, Blackwell.

The aforementioned textbooks will be supplemented with Course Notes and a mixture of readings from academic journals, professional reports and authoritative websites. For those of you in SSCI 587 as well this term, you will recognize that the first, fourth and fifth texts are also required for *SSCI 587: GPS/GIS Field Techniques*.

Readings – To be posted to Blackboard under Course Documents:

1. Downs, R. M. 1997. The geographic eye: Seeing through GIS? *Transactions in GIS* 2: 111-121.
2. Goodchild, M. F. 2011. Spatial thinking and the GIS user interface. *Procedia Social and Behavioral Sciences* 21: 3-9.
3. DiBiase, D. W. 2007. Is GIS a wampeter? *Transactions in GIS* 11: 1-8
4. DiBiase, D. W., M. DeMers, A. Johnson, K. Kemp, A. T. Luck, B. Plewe, and E. Wentz. 2007. Introducing the first edition of Geographic Information Science and Technology Body of Knowledge. *Cartography and Geographic Information Science* 34: 113-118.
5. DiBiase D. W., T. Corbin, T. Fox, J. Francica, K. Green, J. Jackson, G. Jeffress, B. Jones, B. Jones, J. Mennis, K. Schuckman, C. Smith, and J. Van Sickle. 2010. The new Geospatial Technology Competency Model: Bringing workforce needs into focus. *URISA Journal* 22(2): 55-72
6. Goodchild, M. F. 1992. Geographical information science. *International Journal of Geographical Information Systems* 1: 31-45.
7. Wright, D. J., M. F.Goodchild and J. D. Proctor. 1997. Demystifying the persistent ambiguity of GIS as "tool" versus "science". Annals of the Association of American Geographers 87(2): 346-362.

8. Reitsma, F. 2013. Revisiting the 'Is GIScience a science?' debate (or quite possibly scientific gerrymandering). *International Journal of Geographical Information Science* 2: 211-221.
9. Kitchin, R. and M. Dodge. 2007. Rethinking maps. *Progress in Human Geography* 31: 331-334
10. Batty, M., A. Hudson-Smith. R. Milton, and A. Crooks A. 2010. Map mashups, Web 2 and the GIS revolution. *Annals of GIS* 16: 1-13.
11. Goodchild, M. F. 2012 GIScience in the 21st century. In Shi, W., Goodchild, M.F., Lees, B., and Leung, Y. (eds) *Advances in Geo-Spatial Information Science*. Leiden, The Netherlands, CRC Press: 3-10.

Technology – ArcGIS is provided online via the GIST Server; hence, you do not need to install it on your own computer. Instead, every student must satisfy the following technology requirements:

- A computer with a fast Internet connection.
- A functional webcam and a microphone for use whenever a presentation or meeting is scheduled.
- A modern web browser, Firefox recommended, to access the GIST Server

Communications – This is a distance learning course, so most of our interactions will be asynchronous (not at the same time). All materials to be handed in will be submitted via Blackboard. I will also create Blackboard discussion forums throughout the semester that we will use for the aforementioned assignments and so we can discuss comments and issues related to the course assignments, exercises, and projects as the need arises.

In addition, I will send via email through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from Blackboard or from me. Check now to make sure that mail sent from both the USC blackboard accounts and my private domain (katsuhio@usc.edu) does not go into your junk mail!

While I am usually online and will probably respond to emails from students relatively quickly, I will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 48 hours delay. In the rare case when I expect to be offline for more than 72 hours, I will post an announcement on the Blackboard site.

That said, it is each student's responsibility to stay informed about what is going on in our course. In addition to email about time-sensitive topics, any important announcements will be posted on the Announcement page in Blackboard. Be sure to check these each time you log onto Blackboard.

Workload – This is a four credit, one semester course. Students should expect to spend 10-15 hours per week completing the work in this course.

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to an instructor as early in the semester as possible. DSP is located in STU 301 and is open from 8:30 a.m.to 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions can be found at: http://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/.

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Important Administrative Dates

8/25:	Fall semester classes begin
9/1:	Labor Day, university holiday
9/12:	Last day to register and add classes
9/12:	Last day to change enrollment option to Pass/No Pass or Audit
9/12:	Last day to drop a class without a mark of "W" and receive a 100% refund
11/14:	Last day to drop a class with a mark of W
11/26-29:	Thanksgiving recess, university holiday
12/5:	Fall semester classes end
12/18-1/11:	Winter Recess

Tentative Schedule

Week #	Week Begins	Themes	Readings	Assignments Due Tuesday Following			Resume, Quiz, Reports Submission Weeks
				Written Assignments	ArcGIS Tutorials	Discussion Forums	
1	8/25	Introduction	NRC 1, 2			1	
2	9/2	Spatial thinking	NRC 3	1	Price 1	2	Resume
3	9/8	Spatial primitives	Notes	2	Price 2		
4	9/15	Geodesy and datums	Bolstad 3	3	Price 3		
5	9/22	Coordinate systems	Bolstad 3	4	Price 11		Project Proposal
6	9/29	Map projections	Bolstad 3		Price 4		
7	10/6	Geographic information systems	Bolstad 1	5		3	Quiz 1
8	10/13	Geographic information science	Wilson 1	6	Price 6	4	Project Meeting
9	10/20	Future trends	Wilson 33, 34	7	Price 9		
10	10/27	ArcGIS: Data models	Bolstad 2	8	Price 10		
11	11/3	ArcGIS: Vector analysis	Bolstad 9		Price 7		
12	11/10	ArcGIS: Raster analysis	Bolstad 10, 11	9	Price 8		Data Report
13	11/17	Maps and spatial analysis	Mitchell 2	10			
14	11/24	Cartography and the history of maps	Notes	11		5	
15	12/1	Maps in a digital age	Notes				Final Report
	12/5	End of Semester					