

**SSCI 589, Cartography and Visualization**

*Syllabus*

**Units: 4**

**Term Day Time:** Spring 2021, Online

**Location:** ### ### & Online

**Instructor:** Jennifer Bernstein, PhD

**Office:** Remote from Colorado

**Office Hours:** Tuesday 11:00 to 12:00 p.m. PT and Wednesday 01:00 to 02:00 p.m. PT via Zoom.

Please contact the Instructor via email in advance to ensure they will be online. Instructors are also available most days and times by appointment.

**Contact Info:** [bernstjm@usc.edu](mailto:bernstjm@usc.edu)

<https://usc.zoom.us/j/6651478877>

**Library Help:** Andy Rutkowski

**Office:** VKC 36B

**Office Hours:** Tue 10 am-12 pm and Thu 4:30-5:30 pm PT

**Contact Info:** [arutkows@usc.edu](mailto:arutkows@usc.edu), 213-740-6390

<http://bit.ly/andyhangout>

**IT Help:** Richard Tsung

**Office:** AHF 145D

**Office Hours:** By appointment

**Contact Info:** [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu), 213-821-4415

## **Course Scope and Purpose**

This course covers the principles of visual perception, spatial cognition, and cartographic design, and their contributions to the maps, animations, virtual reality and multimedia displays produced with modern GIS. There are three critical components of mapping- exemplary design, the technical skills required to accomplish exemplary design, and creating maps which are consistent with how users interact with them. By understanding these three principles and how they work together, students will leave with a highly marketable skill set applicable to a multitude of research areas and the ability to visually communicate real-world problems.

At its core, cartography is about the visual representation of a space or place, and subsequently cartographers must make a number of carefully-considered choices. In addition, contemporary mapmakers have a greater variety and a much greater volume of data to leverage. Further, the possibilities for mapmaking have expanded considerably alongside advancements in digital mapping. Because maps are tools for communication, cartographers must be able to assess spatial data, determine its relevance to map's objective, and determine the best way to showcase that information. Furthermore, visual design skills are essential to displaying the appropriate information in a user-friendly manner and to make the information easily understood by viewers.

This course will introduce students to the principles of cartography, beginning with the history of the field and the fundamental principles of cartographic design. These include data classification, projection choice, symbolization, generalization, color choice, and labeling. While many of these principles are timeless, this course will emphasize the present and future of mapping, including mapping terrain in 3D, fly-through and stop-motion animation, virtual reality, cybercartography, mobile mapping, and geovisualization. Maps will be explored as an interactivity tool for decision-making. Ultimately, students will complete the course with the technical and conceptual skills needed to create clear, communicative maps that are tailored to a defined task and audience, and anticipate the needs of cartographers in the future.

This 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-level 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 also learn much from your fellow classmates. The challenge for us is to replicate such an academic experience within the milieu of online learning.

## ***Learning Outcomes***

On completion of this course, students should be able to:

- Design and develop cartographic and other kinds of visualizations for a multimedia, internet-enabled world
- Understand the history of mapmaking and cartographic design, and how this history influences contemporary design decision making
- Understand the principles of exemplary cartographic design, including projections, symbology, scale, fonts/typography, etc.
- Become familiar with different types of maps and their appropriateness to different types of questions and data (chloropleth, proportional symbol, isarithmic, point density, etc.).

- Apply ones understanding of cartographic design principles to evaluating maps
- Become well-versed in selecting, transforming, and projecting, and visualizing data within ArcGIS and other platforms
- Understand human psychology as it applies to map interpretation; optimize the way in which users interact with web-based maps
- Create finished maps according to industry-standard design principles

**Prerequisite(s):** SSCI 581 (Recommended)

**Co-Requisite(s):** None

### **Class Conduct**

**Harassment, sexual misconduct, interpersonal violence, and stalking** are not tolerated by the university. All faculty and most staff are considered Responsible Employees by the university and must forward all information they receive about these types of situations to the Title IX Coordinator. The Title IX Coordinator is responsible for assisting students with supportive accommodations, including academic accommodations, as well as investigating these incidents if the reporting student wants an investigation. The Title IX office is also responsible for coordinating supportive measures for transgender and nonbinary students such as faculty notifications, and more. If you need supportive accommodations you may contact the Title IX Coordinator directly ([titleix@usc.edu](mailto:titleix@usc.edu) or 213-821-8298) without sharing any personal information with me. If you would like to speak with a confidential counselor, Relationship and Sexual Violence Prevention Services (RSVP) provides 24/7 confidential support for students (213-740-9355 (WELL); press 0 after hours)

### **Course Structure**

The main theoretical concepts are provided through a directed reading of the text, *Designing better Maps: A Guide for GIS users*. Additional readings will regularly be assigned to expand on the text. When possible, assignments will be given in advance, but they will typically be posted on or before Sunday.

*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.

### **Technological and Communication Requirements**

ArcGIS is provided online via the GIST Server; hence, you do not need to install it on your own computer. Instead, every student must have 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.
- An up-to-date web browser to access the Server

*Blackboard* – A course Blackboard site is available to provide guidance as to the required administrative processes and manuscript format. Links to necessary timetables, procedures, and forms will be found here, as well as discussion boards through which students can share ideas with other thesis students. During the first week of the semester, each student should confirm that they can access the Blackboard site. All communications that are sent through it should be read promptly.

*SSI server and tech support* – Students in this course will utilize the Spatial Sciences Institute Server for independent thesis work as needed. If a student is unable to connect to the server or experiences technical issues, an email should be sent to SSI Tech Support at [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu) and the

instructor should be copied (cc). The email sent to SSI Support should be specific with respect to the problem being experienced.

**Zoom** – Zoom is a browser-based service that facilitates synchronous, interactive sessions with voice/video and shared desktop capabilities between two or more people. This is the primary forum for individual meetings and presentations. To use Zoom, each student needs a web cam on a computer with a fast internet connection. It is useful also to have a phone on hand in case there are issues with the web cam audio.

**Communications** – This is a distance learning course, so interactions will be asynchronous (not at the same time). All materials to be handed in will be submitted via Blackboard or via email. Students should check to make sure that mail sent from both the USC Blackboard accounts and directly from the instructors usc.edu account does not go into junk mail. Students should read as soon as possible all email sent from Blackboard or from the instructor.

### **Required Readings and Supplementary Materials**

The required textbook for this course is:

- Brewer, Cynthia. 2015. *Designing better Maps: A Guide for GIS users* (2nd Ed.). Redlands, CA: Esri Press.

Supplementary readings will be assigned from various sources, including but not limited to:

- Battersby, S.E., Goldsberry, K.P. 2010. Considerations in design of transition behaviors for dynamic thematic maps. *Cartographic Perspectives* 65: 16-32.
- Heffernan, M., Thorpe, B.J. 2018. 'The map that would save Europe': Clive Morrison-Bell, the Tariff Walls Map, and the politics of cartographic display. *Journal of Historical Geography* 60: 24-40.
- Hegarty, M., Smallman, H.S., Stull, A.T., Canham, M.S. 2009. Naïve cartography: How intuitions about display configuration can hurt performance. *Cartographica: The International Journal for Geographic Information and Geovisualization* 44, No. 3: 171-186.
- Hruby, F., Ressler, R., de la Borbolla Del Valle, G. 2019. Geovisualization with immersive virtual environments in theory and practice. *International Journal of Digital Earth* 12, No. 2: 123-136.
- Johnson, S. 2006. *The ghost map: The story of London's most terrifying epidemic--and how it changed science, cities, and the modern world*. Penguin Press.
- Misra, R.P., Ramesh, A. 1989. *Fundamentals of cartography*. Concept Publishing Company,.
- Monmonier, Mark. *How to lie with maps*. University of Chicago Press.
- Rao, J., Qiao, Y., Ren, F., Wang, J, Du, Q. 2017A mobile outdoor augmented reality method combining deep learning object detection and spatial relationships for geovisualization. *Sensors* 17, No. 9: 1951.
- Robinson, A. Geovisual analytics. *The Geographic Information Science & Technology Body of Knowledge* (3rd Quarter 2017), Wilson, J.P. ed. UCGIS. <https://doi.org/10.22224/gistbok/2017.36> (2017).
- Taylor, D.R., Anonby, E., and Murasugi, K., (Eds). *Further Developments in the Theory and Practice of Cybercartography: International Dimensions and Language Mapping*. Elsevier, 2019.
- Tufte, E.R., Goeler, N.H, Benson, R. 1990. *Envisioning information*. Vol. 126. Cheshire, CT: Graphics press.
- Wilmott, C. 2020. *Mobile Mapping: Space, Cartography and the Digital*. Amsterdam University Press.
- Wright, D.J. 2017. Here Be Monsters. *Oceanography*. 30 (2).

- Yan, Y., Feng, C., Huang, W., Fan, H., Wang, Y., Zipf, A. 2020. Volunteered geographic information research in the first decade: a narrative review of selected journal articles in GIScience. *International Journal of Geographical Information Science*. 1(27).

### **Description and Assessment of Assignments**

This course includes a diversity of assessments that allow students to gain knowledge and experience and to show their mastery of the material in a variety of ways. The different types of assessments are described below and their overall point value to are summarized in the following Grading Breakdown section.

*Resume Assignment - 1 worth 2 points.* We require all current students to post and maintain a public resume, short biography, and recent photo on our shared SSI Student Community Blackboard site. Please prepare your resume in the SSI template which will be provided to you. Unless you opt out, your resume will be included in the Spatial Sciences Institute Graduate Programs Resume Book. This resume book is compiled annually and, along with our web presence, is used to promote our programs, and more importantly, your skills, experience and professional aspirations.

*Projects - 5 worth a total of 50 points.* These assignments will require students to develop a cartographic workflow, evaluate sources of error, decide on projections, and generalize their data. They will cover the principles of color, symbolization, and labeling. Differences in map output will be discussed, with an emphasis on web and mobile technologies and publishing across multiple platforms. Three-dimensional rendering and animation will be covered. Each project will result in map (print, web, mobile, or multi-platform) that can be included in one's portfolio.

*Reading and Research Discussions - 5 worth a total of 15 points.* These assignments will consist of a combination of academic articles, book excerpts, and the critical evaluation of existing maps. Students will be expected to engage in discussions about these materials.

*Quizzes –* Each module will conclude with a quiz covering the main principles of the unit. The quiz will be timed and administered on Blackboard.

*Final Exam - 1 worth 18 points.* The final exam will cover material learned throughout the duration of the semester. It may be mixed format and may consist of multiple choice, short answer, and simple problem questions. Students are expected to take the exam within an indicated time window.

### **Grading Breakdown**

The table below shows the breakdown of the assessments and their weight in the final grade. The emphasis is on regularly completing a number of labs that apply exemplary cartographic principles and a variety of visualization methods, as well as gain a mastery of the principles of cartographic design.

Assessment	Number	Points Each	Total Points
<b>Weekly Assignments</b>			
Resume Assignment	1	2	2
Projects	5	9	45
Reading and Research Assignments	5	3	15
Quizzes	5	3	15
Final Exam	1	18	18
<b>Total</b>			<b>95</b>

### Schedule

Week	Topic	Assignments	Deliverables: Due Dates
<b>Module 1   The Fundamentals of Map-making I</b>			
<b>Week 1</b> 1/11	Introduction to course; Initial exploration of interactive web-based mapping; Historical cartography; Overview of the principles of contemporary cartographic design	Resume Assignment Reading & Research Discussion (RRD) 1	
<b>Week 2</b> 1/18* *Monday, 1/18 is university holiday		RRD1 - Discussion RRD2 - Choice of case study Project 1 is assigned	RRD1 – Assignment and 1 <sup>st</sup> discussion post RRD1 – Discussion: Response to classmates Resume Assignment
<b>Week 3</b> 1/25		RRD2 - Discussion	RRD2 – Assignment and 1 <sup>st</sup> discussion post RRD2 – Discussion: Response to classmates Module 1 Quiz
<b>Module 2   The Fundamentals of Map-making II</b>			
<b>Week 4</b> 2/1	Data management and classification; Map Typologies I: Chloropleth, Proportional symbol Map Typologies II: Isoline, Isarithmic,	RRD3 - Choice of case study RRD3 - Discussion	Project 1
<b>Week 5</b> 2/8		RRD4 - Choice of case study Wiki contribution Project 2 is assigned	RRD3- Assignment and 1 <sup>st</sup> discussion post RRD3 - Discussion: Response to classmates

<b>Week</b>	<b>Topic</b>	<b>Assignments</b>	<b>Deliverables: Due Dates</b>
<b>Week 6</b> 2/15	dot density	RRD4 - Discussion	RRD4 - Assignment and 1 <sup>st</sup> discussion post RRD4 - Response to classmates Module 2 Quiz
<b>Module 3   Visualization and Cognition</b>			
<b>Week 7</b> 2/22* *Monday, 2/22 is university holiday	Use of colorization schemes, contrast, and patterns; Map animation and temporal scales; Human perception, cognition, and behavior	RRD5 - Choice of case study	RRD5 - Assignment and 1 <sup>st</sup> discussion post RRD5 - Response to classmates due
<b>Week 8</b> 3/1		RRD5 - Discussion RRD6 - Choice of case study	Project 2
<b>Week 9</b> 3/8		RRD6 - Discussion RRD7 - Choice of case study Project 3 is assigned	RRD6 - Assignment and 1 <sup>st</sup> discussion post RRD6 - Response to classmates
<b>3/15*</b> *3/14-3/21 is Spring Recess	<i>Spring Recess</i>		
<b>Week 10</b> 3/22		RRD7 - Discussion	RRD7- Assignment and 1 <sup>st</sup> discussion post RRD7 - Response to classmates Module 3 Quiz
<b>Module 4   Data Exploration and Interactivity</b>			
<b>Week 11</b> 3/29	User Interface design (UI); Volunteered Geographic Information (VGI)	RRD8 - Choice of case study Project 4 is assigned	Project 3
<b>Week 12</b> 4/5		RRD8 – Discussion RRD9 - Choice of case study Project 5 is assigned	RRD8 - Assignment and 1 <sup>st</sup> discussion post RRD8 – Discussion RRD9 - Assignment and 1 <sup>st</sup> discussion post RRD9 - Discussion Project 4 Module 4 Quiz
<b>Module 5   The Future of Cartography</b>			

<b>Week</b>	<b>Topic</b>	<b>Assignments</b>	<b>Deliverables: Due Dates</b>
<b>Week 13</b> 4/12	Virtual reality and the future of maps; Exam Week	RRD9 – Discussion	RRD10 - Assignment and 1 <sup>st</sup> discussion post
<b>Week 14</b> 4/19		RRD – 10 Choice of Case Study and Discussion	RRD10 – Slides and class presentations Project 5 Module 5 Quiz
<b>Week 15</b> 4/26* *Friday, 4/30 is last day of class			Final Exam



## Statement on Academic Conduct and Support Systems

### **Academic Conduct**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, Behavior Violating University Standards [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

### **Support Systems**

*Counseling and Mental Health*– (213) 740-9355 – 24/7 on call  
[engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

*National Suicide Prevention Lifeline* – 1 (800) 273-8255 – 24/7 on call  
[www.suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

*Relationship and Sexual Violence Prevention Services (RSVP)* – (213) 740-9355(WELL), press 0 after hours – 24/7 on call  
[studenthealth.usc.edu/sexual-assault](http://studenthealth.usc.edu/sexual-assault)

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

*Office of Equity and Diversity (OED)* – (213) 740-5086 | *Title IX Compliance* – (213) 821-8298  
[equity.usc.edu](http://equity.usc.edu), [titleix.usc.edu](http://titleix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment*– (213) 740-5086 or (213) 821-8298  
[usc-advocate.symplicity.com/care\\_report](http://usc-advocate.symplicity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

*The Office of Disability Services and Programs* – (213) 740-0776  
[dsp.usc.edu](http://dsp.usc.edu)

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

*USC Campus Support and Intervention* – (213) 821-4710  
[uscsa.usc.edu](http://uscsa.usc.edu)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

*Diversity at USC – (213) 740-2101*

[diversity.usc.edu](http://diversity.usc.edu)

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

*USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu), [emergency.usc.edu](http://emergency.usc.edu)

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

*USC Department of Public Safety – - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu)

Non-emergency assistance or information.

### ***Resources for Online Students***

The Course Blackboard page and the GIST Community Blackboard page have many resources available for distance students enrolled in our graduate programs. In addition, all registered students can access electronic library resources through the link <https://libraries.usc.edu/>. Also, the USC Libraries have many important resources available for distance students through the link: <https://libraries.usc.edu/faculty-students/distance-learners>. These include instructional videos, remote access to university resources, and other key contact information for distance students.