

## **SSCI 683: Principles of Spatial Data Analysis**

**Units:** 4

**Term—Day—Time:** Spring, 2018, Thursdays, 2-4:50 pm

**Location:** Spatial Sciences Institute, AHF 145D

**Instructor:** An-Min Wu, Ph.D.

**Office:** AHF B55B

**Office Hours:** Tuesdays 3 pm – 4 pm and Thursdays 12 noon – 1 pm, or by appointment.

**Contact Info:** anminwu@usc.edu, 213-740-2876 (office)

**Library Help:** Andrzej Rutkowski

**Office:** USC VKC Library 36B

**Office Hours:** Tuesdays 10am – 12 noon & Thursdays 4:30 pm – 5:30 pm

**Contact Info:** arutkows@usc.edu, 213-740-6390 (office),  
<http://bit.ly/andyhangout>

**IT Help:** Richard Tsung

**Office:** AHF B57E

**Office Hours:** By appointment

**Contact Info:** ctsung@usc.edu, 213-821-4415 (office)

## Course Description

This course explores the theoretical foundations, methods, techniques, and software systems for spatial analysis. The course aims to provide students with the knowledge and skills necessary to investigate spatial health problems. Essential concepts of quantitative geographic information are presented, including the fundamental spatial concepts, the core components of geospatial analysis techniques, exploratory spatial data analysis and spatial statistics, surface analysis, and network and locational analysis. The latest research in a variety of topics related to population, health, and place that are central to spatial analysis are also examined. Students will also gain a deep understanding and hands-on experience in the ways to explore a variety of health-related applications through a combination of homework and projects. Students will learn about the wide variety of geospatial data and analytical tools available, including how to find relevant data and transform it as needed so that it can be used for solving specific health-related challenges and problems.

## Learning Objectives

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

- Describe key theoretical foundations of geospatial analysis.
- Identify and investigate spatial and non-spatial data to understand the importance of place and its role in shaping or moderating environmental exposures, health-related impacts and outcomes, and the efficacy of health care delivery systems.
- Evaluate spatial analysis approaches and techniques for working with health-related geospatial data.
- Apply relevant spatial analysis techniques to solve spatial health problems.

**Prerequisite(s):** None

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

**Concurrent Enrollment:** None

**Recommended Preparation:** Students must be enrolled in an existing USC PhD program

## Course Structure

The course will be delivered using both lectures and class discussion formats. During each class, the instructor will present the core topics and the students will participate and give presentations on some of the subtopics in the first hour and a half. For the remaining of the time in the class, students will lead and participate in group discussions about the readings. The class will encourage student participation with ample discussion time for reviewing readings, homework assignments, and other course material. Throughout the semester there will be homework assignments to give students first-hand experience in spatial analysis as well as weekly briefings to ensure students keep up with the readings. Students design and conduct individual final projects to learn in more depth in one or

more topics of interest and demonstrate their ability to apply spatial analysis tools in resolving spatial health problems.

## Technological Requirements

The analysis software and geospatial data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute. The course will be focused on using ArcGIS and R.

## Required Readings and Supplementary Materials

The required textbooks for this course are:

- De Smith, Michael J., Michael F. Goodchild, and Paul A. Longley. 2015. *Geospatial analysis: a comprehensive guide to principles, techniques and software tools* (5<sup>th</sup> Ed.). Winchelsea, UK: Winchelsea Press. (Available online: <http://www.spatialanalysisonline.com/index.html>).
- O'Sullivan, David, and David Unwin. 2010. *Geographic Information Analysis*, 2nd Edition. New York, NY: John Wiley & Sons. (available online via USC Libraries)

Supplementary readings will be assigned from various sources and will be accessed via the USC Library's electronic collections and/or provided by the instructors via Blackboard, including:

- Anselin, Luc. "Local indicators of spatial association—LISA." *Geographical Analysis* 27, no. 2 (1995): 93-115.
- Auchincloss, Amy H., and Ana V. Diez Roux. "A new tool for epidemiology: the usefulness of dynamic-agent models in understanding place effects on health." *American Journal of Epidemiology* 168, no. 1 (2008): 1-8.
- Auchincloss, Amy H., Rick L. Riolo, Daniel G. Brown, Jeremy Cook, and Ana V. Diez Roux. "An agent-based model of income inequalities in diet in the context of residential segregation." *American Journal of Preventive Medicine* 40, no. 3 (2011): 303-311.
- Baker, David M., and Alain-Jacques Valleron. "An open source software for fast grid-based data-mining in spatial epidemiology (FGBASE)." *International Journal of Health Geographics* 13, no. 1 (2014): 46.
- Barakat-Haddad, Caroline, Susan J. Elliott, and David Pengelly. "Does chronic exposure to air pollution in childhood impact long-term respiratory health?" *The Professional Geographer* 64, no. 3 (2012): 446-463.
- Bell, Sarah L., Cassandra Phoenix, Rebecca Lovell, and Benedict W. Wheeler. "Green space, health and wellbeing: Making space for individual agency." *Health & Place* 30 (2014): 287-292.

- Beyer, Kirsten MM, Chetan Tiwari, and Gerard Rushton. "Five essential properties of disease maps." *Annals of the Association of American Geographers* 102, no. 5 (2012): 1067-1075.
- Bian, Ling, Yuxia Huang, Liang Mao, Eunjung Lim, Gyoungju Lee, Yan Yang, Murray Cohen, and Deborah Wilson. "Modeling individual vulnerability to communicable diseases: A framework and design." *Annals of the Association of American Geographers* 102, no. 5 (2012): 1016-1025.
- Boone-Heinonen, Janne, Penny Gordon-Larsen, David K. Guilkey, David R. Jacobs, and Barry M. Popkin. "Environment and physical activity dynamics: the role of residential self-selection." *Psychology of Sport and Exercise* 12, no. 1 (2011): 54-60.
- Brownson, Ross C., Christine M. Hoehner, Kristen Day, Ann Forsyth, and James F. Sallis. "Measuring the built environment for physical activity: state of the science." *American Journal of Preventive Medicine* 36, no. 4 (2009): S99-S123.
- Cao, Xinyu, Patricia L. Mokhtarian, and Susan L. Handy. "Examining the impacts of residential self-selection on travel behaviour: a focus on empirical findings." *Transport Reviews* 29, no. 3 (2009): 359-395.
- Conley, Jamison F. "Estimation of exposure to toxic releases using spatial interaction modeling." *International journal of health geographics* 10, no. 1 (2011): 20.
- Hampton, Kristen H., Marc L. Serre, Dionne C. Gesink, Christopher D. Pilcher, and William C. Miller. "Adjusting for sampling variability in sparse data: geostatistical approaches to disease mapping." *International Journal of Health Geographics* 10, no. 1 (2011): 54.
- Hirsch, Jana A., Meghan Winters, Philippa Clarke, and Heather McKay. "Generating GPS activity spaces that shed light upon the mobility habits of older adults: a descriptive analysis." *International Journal of Health Geographics* 13, no. 1 (2014): 51.
- Jacquez, Geoffrey M. "A k nearest neighbour test for space-time interaction." *Statistics in Medicine* 15, no. 18 (1996): 1935-1949.
- James, Peter, Mariana C. Arcaya, Devin M. Parker, Reginald D. Tucker-Seeley, and S. V. Subramanian. "Do minority and poor neighborhoods have higher access to fast-food restaurants in the United States?" *Health and Place* 29 (2014): 10-17.
- Jerrett, Michael, Sara Gale, and Caitlin Kontgis. "Spatial modeling in environmental and public health research." *International Journal of Environmental Research and Public Health* 7, no. 4 (2010): 1302-1329.
- Jerrett, Michael, Michelle C. Turner, Bernardo S. Beckerman, C. Arden Pope III, Aaron van Donkelaar, Randall V. Martin, Marc Serre et al. "Comparing the health effects of ambient particulate matter estimated using ground-based versus remote sensing exposure estimates." *Environmental Health Perspectives* 125, no. 4 (2017): 552.
- Jia, Tao, Hongbing Tao, Kun Qin, Yulong Wang, Chengkun Liu, and Qili Gao. "Selecting the optimal healthcare centers with a modified P-median model: a

visual analytic perspective." *International Journal of Health Geographics* 13, no. 1 (2014): 42.

- Kassteele, Jan, Laurens Zwakhals, Oscar Breugelmans, Caroline Ameling, and Carolien Brink. "Estimating the prevalence of 26 health-related indicators at neighbourhood level in the Netherlands using structured additive regression." *International Journal of Health Geographics* 16, no. 1 (2017): 23.
- Kulldorff, Martin. "A spatial scan statistic." *Communications in Statistics: Theory and Methods* 26, no. 6 (1997): 1481-1496.
- Kulldorff, Martin, and Neville Nagarwalla. "Spatial disease clusters: detection and inference." *Statistics in Medicine* 14, no. 8 (1995): 799-810.
- Kwan, Mei-Po. "The uncertain geographic context problem." *Annals of the Association of American Geographers* 102, no. 5 (2012): 958-968.
- Lemke, Dorothea, Volkmar Mattauch, Oliver Heidinger, Edzer Pebesma, and Hans-Werner Hense. "Detecting cancer clusters in a regional population with local cluster tests and Bayesian smoothing methods: a simulation study." *International Journal of Health Geographics* 12, no. 1 (2013): 54.
- Louis, Valérie R., Revati Phalkey, Olaf Horstick, Pitcha Ratanawong, Annelies Wilder-Smith, Yesim Tozan, and Peter Dambach. "Modeling tools for dengue risk mapping-a systematic review." *International Journal of Health Geographics* 13, no. 1 (2014): 50.
- Luna, A. S., M. L. L. Paredes, G. C. G. de Oliveira, and S. M. Corrêa. "Prediction of ozone concentration in tropospheric levels using artificial neural networks and support vector machine at Rio de Janeiro, Brazil." *Atmospheric Environment* 98 (2014): 98-104.
- Macintyre, H. L., C. Heaviside, J. Taylor, R. Picetti, P. Symonds, X-M. Cai, and S. Vardoulakis. "Assessing urban population vulnerability and environmental risks across an urban area during heatwaves—Implications for health protection." *Science of The Total Environment* 610 (2018): 678-690.
- Martins-Melo, Francisco Rogerlândio, Alberto Novaes Ramos, Carlos Henrique Alencar, Wolfram Lange, and Jorg Heukelbach. "Mortality of Chagas' disease in Brazil: spatial patterns and definition of high-risk areas." *Tropical Medicine & International Health* 17, no. 9 (2012): 1066-1075.
- Matthews, Stephen A., and Tse-Chuan Yang. "Spatial Polygamy and Contextual Exposures (SPACES) Promoting Activity Space Approaches in Research on Place And Health." *American Behavioral Scientist* 57, no. 8 (2013): 1057-1081.
- McCann, Robert S., Joseph P. Messina, David W. MacFarlane, M. Nabie Bayoh, John M. Vulule, John E. Gimnig, and Edward D. Walker. "Modeling larval malaria vector habitat locations using landscape features and cumulative precipitation measures." *International Journal of Health Geographics* 13, no. 1 (2014): 17.
- Messina, Joseph P., Nathan J. Moore, Mark H. DeVisser, Paul F. McCord, and Edward D. Walker. "Climate change and risk projection: dynamic spatial models of

tsetse and African trypanosomiasis in Kenya." *Annals of the Association of American Geographers* 102, no. 5 (2012): 1038-1048.

- Mobley, Lee R., Tzy-Mey Kuo, Matthew Urato, Sujha Subramanian, Lisa Watson, and Luc Anselin. "Spatial heterogeneity in cancer control planning and cancer screening behavior." *Annals of the Association of American Geographers* 102, no. 5 (2012): 1113-1124.
- Nkoko, Didier Bompangue, Patrick Giraudoux, Pierre-Denis Plisnier, Annie Mutombo Tinda, Martine Piarroux, Bertrand Sudre, Stephanie Horion, Jean-Jacques Muyembe Tamfum, Benoit Kebela Ilunga, and Renaud Piarroux. "Dynamics of cholera outbreaks in Great Lakes region of Africa, 1978–2008." *Emerging Infectious Diseases* 17, no. 11 (2011): 2026.
- O'Campo, P., Blair Wheaton, Rosane Nisenbaum, Richard H. Glazier, James R. Dunn, and Catharine Chambers. "The neighbourhood effects on health and well-being (NEHW) study." *Health & Place* 31 (2015): 65-74.
- Palisson, Aurore, Aurélie Courcoul, and Benoit Durand. "Analysis of the Spatial Organization of Pastures as a Contact Network, Implications for Potential Disease Spread and Biosecurity in Livestock, France, 2010." *PloS one* 12, no. 1 (2017): e0169881.
- Patz, Jonathan A., Howard Frumkin, Tracey Holloway, Daniel J. Vimont, and Andrew Haines. "Climate change: challenges and opportunities for global health." *Journal of the American Medical Association* 312, no. 15 (2014): 1565-1580.
- Pijanowski, Bryan C., Amin Tayyebi, Jarrod Doucette, Burak K. Pekin, David Braun, and James Plourde. "A big data urban growth simulation at a national scale: configuring the GIS and neural network based land transformation model to run in a high performance computing (HPC) environment." *Environmental Modelling & Software* 51 (2014): 250-268.
- Root, Elisabeth Dowling. "Moving neighborhoods and health research forward: using geographic methods to examine the role of spatial scale in neighborhood effects on health." *Annals of the Association of American Geographers* 102, no. 5 (2012): 986-995.
- Sexton, Joseph O., Xiao-Peng Song, Chengquan Huang, Saurabh Channan, Matthew E. Baker, and John R. Townshend. "Urban growth of the Washington, DC–Baltimore, MD metropolitan region from 1984 to 2010 by annual, Landsat-based estimates of impervious cover." *Remote Sensing of Environment* 129 (2013): 42-53.
- Shi, Xun, Jennifer Alford-Teaster, Tracy Onega, and Dongmei Wang. "Spatial access and local demand for major cancer care facilities in the United States." *Annals of the Association of American Geographers* 102, no. 5 (2012): 1125-1134.
- Spencer, John, and Gustavo Angeles. "Kernel density estimation as a technique for assessing availability of health services in Nicaragua." *Health Services and Outcomes Research Methodology* 7, no. 3-4 (2007): 145-157.

- Spielman, Seth E., and John R. Logan. "Using high-resolution population data to identify neighborhoods and establish their boundaries." *Annals of the Association of American Geographers* 103, no. 1 (2013): 67-84.
- Spielman, Seth E., and Eun-hye Yoo. "The spatial dimensions of neighborhood effects." *Social Science and Medicine* 68, no. 6 (2009): 1098-1105.
- Tatalovich, Zaria, John P. Wilson, and Myles Cockburn. "A comparison of thiesen polygon, kriging, and spline models of potential UV exposure." *Cartography and Geographic Information Science* 33, no. 3 (2006): 217-231.
- Tatalovich, Zaria, John P. Wilson, Thomas Mack, Ying Yan, and Myles Cockburn. "The objective assessment of lifetime cumulative ultraviolet exposure for determining melanoma risk." *Journal of Photochemistry and Photobiology B: Biology* 85, no. 3 (2006): 198-204.
- Wan, Neng, Bin Zou, and Troy Sternberg. "A three-step floating catchment area method for analyzing spatial access to health services." *International Journal of Geographical Information Science* 26, no. 6 (2012): 1073-1089.
- Wheeler, David C., Mary H. Ward, and Lance A. Waller. "Spatial-temporal analysis of cancer risk in epidemiologic studies with residential histories." *Annals of the Association of American Geographers* 102, no. 5 (2012): 1049-1057.
- Wu, Wei, Junqiao Guo, Peng Guan, Yingwei Sun, and Baosen Zhou. "Clusters of spatial, temporal, and space-time distribution of hemorrhagic fever with renal syndrome in Liaoning Province, Northeastern China." *BMC Infectious Diseases* 11, no. 1 (2011): 229. Xia, Ting, Monika Nitschke, Ying Zhang, Pushan Shah, Shona Crabb, and Alana Hansen. "Traffic-related air pollution and health co-benefits of alternative transport in Adelaide, South Australia." *Environment International* 74 (2015): 281-290.
- Yang, Yong, and Peter M. Atkinson. "Individual space–time activity-based model: a model for the simulation of airborne infectious-disease transmission by activity-bundle simulation." *Environment and Planning B: Planning and Design* 35, no. 1 (2008): 80-99.
- Yang, Yong, and Peter M. Atkinson. "Parameter exploration of the raster space activity bundle simulation." *Journal of Geographical Systems* 10, no. 3 (2008): 263.

## Description and Assessment of Assignments

Students must prepare two small lecture-style presentations, participate in class discussion, submit weekly briefings, and turn in homework assignments.

Weekly Briefings (14, worth a total of 14%): Each week students select one or more of the assigned readings and share a commentary with other students in the online Discussion Forum before the class session.

Class Participation (14, worth a total of 14%): A class participation grade for the semester will be assigned based upon how actively students engage in the class sessions. Students will be required to read all material outlined for each week of the course, and be prepared to lead and participate in group discussions about the readings in class. Failure

to attend or to be adequately prepared to discuss the readings will lead to the assignment of a lower grade for that week.

Homework Assignments (6, worth a total of 30%): Students will be assigned a total of 6 homework assignments in this course. These hands-on assignments are to practice spatial analysis techniques explored in theory in the texts. You will analyze the data of your own choice using ArcGIS and/or R scripts, and write a short report to answer the questions assigned in each assignment.

Class Presentations (2, worth a total of 10%): Students will conduct two presentations based on topics determined in consultation with the instructor. Students will work alone and will be expected to become an expert on that topic and present a short lecture of 30-45 minutes on the topic.

### **Final Project**

Each student will design, conduct and report on a research project related to spatial analysis topics covered in class. The students will propose their own project ideas and determine the topics to be included after consultation with the instructor. The project might take one of two forms: (1) You may have a specific problem in mind and some data you want to analyze; or (2) You may be interested in exploring a spatial analysis method more deeply. The three components of the project will be due at different times during the semester. The grading rubric for each project component will be provided at the time the assignment is released. The three final project components include:

Proposal (2%): A brief description of the spatial questions and/or spatial analysis method you would like to investigate, how you plan to solve them and the data to be used for analysis.

Presentation (10%): A final presentation during the final week of the class session.

Report (20%): A written report in the format of a research paper on your final project methodology and outcomes.

### **Grading Breakdown**

Assessments	Number	% Each	Total % of Grade
Weekly Briefings	14	1	14
Class Participation	14	1	14
Homework Assignments	6	5	30
Class Presentations	2	5	10
Final Project Proposal	1	2	2
Final Project Presentation	1	10	10
Final Project Report	1	20	20
Total	39	-	100

### **Assignment Submission Policy**

Assignments will be submitted for grading via Blackboard using the due dates specified in the Course Schedule below.



## Additional Policies

Students are expected to attend and participate in every class session and to complete and upload all assignments before the deadlines detailed in the Course Schedule. Late work will be assessed a penalty of 10% per day and zero grades will be assigned for work that is more than one week late.

## Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Assignments	Deliverables/Due Dates
<b>Week 1</b> 1/11	Spatial Data Analysis Basics	De Smith et al. (2015) Ch. 1 – 2 O'Sullivan & Unwin (2010) Ch.1 Bell et al. (2014) Beyer et al. (2012) Patz et al. (2014)	Weekly briefing: Wednesday, 1/10
<b>Week 2</b> 1/18	Methodological Context	De Smith et al. (2015). Ch. 3 Boone-Heinonen et al. (2011) Brownson et al. (2009) Spielman & Logan (2013) Spielman & Yoo (2009) Homework Assignment #1	Weekly briefing: Wednesday, 1/17  Propose class presentation topics
<b>Week 3</b> 1/25	Geometric Operations and Density Measures	De Smith et al. (2015). Ch. 4 – §4.3 Jerrett et al. (2010) Hirsch et al. (2014) Matthews & Yang (2013) Kwan (2012)	Weekly briefing: Wednesday, 1/24  Homework Assignment #1: Friday, 1/26
<b>Week 4</b> 2/1	Distance, Directional, & Grid Operations	De Smith et al. (2015). §4.4 - §4.6 Cao et al. (2009) James et al. (2014) Root (2012) Homework Assignment #2	Weekly briefing: Wednesday, 2/2
<b>Week 5</b> 2/8	Exploratory Spatial Data Analysis	De Smith et al. (2015). Ch. 5-§5.2 ( Jacquez (1996) Nkoko et al. (2011) Wheeler et al. (2012) Homework Assignment #3	Weekly briefing: Wednesday, 2/7  Homework Assignment #2: Friday, 2/9
<b>Week 6</b> 2/15	Grid-based Statistics & Models	De Smith et al. (2015) §5.3 Baker & Valleron (2014) Sexton et al. (2013) Yang & Atkinson (2008a) Yang & Atkinson (2008b)	Weekly briefing: Wednesday, 2/16  Homework Assignment #3: Friday, 2/16
<b>Week 7</b> 2/22	Point Sets & Distance Statistics	De Smith et al. (2015). §5.4 O'Sullivan & Unwin (2010) Ch. 5-6. Spencer and Angeles (2007) Kulldorff & Nagarwalla (1995) Kulldorff (1997) Homework Assignment #4	Weekly briefing: Wednesday, 2/21  Final project proposal discussion meetings
<b>Week 8</b> 3/1	Spatial Autocorrelation	De Smith et al. (2015). §5.5 Anselin (1995) Wu et al. (2011) Lemke et al. (2013) Martins-Melo et al. (2012)	Weekly briefing: Wednesday, 2/28  Homework Assignment #4: Friday, 3/2

<b>Week 9</b> 3/8	Spatial Regression	De Smith et al. (2015). §5.6 Conley (2011) O'Campo et al. (2015) Barakat-Haddad et al. (2012) Kasstele et al. (2017) Homework Assignment #5	Weekly briefing: Wednesday, 3/7  Final project proposal due: Friday, 3/9
3/11-3/18	<i>Spring Recess</i>		
<b>Week 10</b> 3/22	Surface & Field Analysis	De Smith et al. (2015). Ch. 6-§6.1 Macintyre et al. (2018) Messina et al. (2012) McCann et al. (2014) Homework Assignment #6	Weekly briefing: Wednesday, 3/21  Homework Assignment #5: Friday, 3/23
<b>Week 11</b> 3/29	Deterministic Interpolation Methods	De Smith et al. (2015). §6.5-§6.6 Tatalovich et al. (2006a) Tatalovich et al. (2006b) Xia et al. (2015)	Weekly briefing: Wednesday, 3/28  Homework Assignment #6: Friday, 3/30
<b>Week 12</b> 4/5	Geostatistical Interpolation Methods	De Smith et al. (2015). §6.7 Louis et al. (2014). Hampton et al. (2011) Jerrett et al. (2017)	Weekly briefing: Wednesday, 4/4
<b>Week 13</b> 4/12	Network Analysis, Location and Service Area Problems	De Smith et al. (2015). Ch. 7 Palisson et al. (2017) Bian et al. (2012) Shi et al. (2012) Wan et al. (2012) Jia et al. (2014)	Weekly briefing: Wednesday, 4/11
<b>Week 14</b> 4/19	Emerging Spatial Analysis Methods	De Smith et al. (2015). Ch.8 - §8.3. O'Sullivan & Unwin Ch.12 Auchincloss & Diez Roux (2008) Auchincloss et al. (2011) Luna et al. (2014) Pijanowski et al. (2014)	Weekly briefing: Wednesday, 4/18
<b>Week 15</b> 4/26* *4/27 is the last day of class	Final Presentations	Final Presentations & Final Discussions	Final presentation slides due by Thursday, 4/26 8 AM
<b>FINAL</b> 5/5			Final report submission during the scheduled final examination: 12:30 - 3pm on Saturday, May 5

## 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” <https://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

*Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call*

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <https://engemannshc.usc.edu/counseling/>

*National Suicide Prevention Lifeline - 1-800-273-8255*

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

*Relationship & Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

*Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086*

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <https://equity.usc.edu/>

*Bias Assessment Response and Support*

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <https://studentaffairs.usc.edu/bias-assessment-response-support/>

*Student Support & Advocacy – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

*Diversity at USC – <https://diversity.usc.edu/>*

Tab for Events, Programs and Training, Task Force (including representatives for each school), Chronology, Participate, Resources for Students