Cover Sheet: Request 13336

GIS 4XXX GIS Analysis of Hazard Vulnerability

Info

Process	Course|New|Ugrad/Pro
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Kevin Ash kash78@ufl.edu
Created	11/9/2018 10:07:27 AM
Updated	1/12/2019 4:50:16 PM
Description of request	This request is for approval of a new GIS course to be taught within the Department of Geography.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CLAS - Geography 011609000	Jane Southworth		11/9/2018
UCC_Ext_Consult_GIS4XXX_GIS_Analysis_Hazard_Vulnerability.pdf GIS_Analysis_Hazard_Vulnerability_GIS4XXX_Syllabus_General.pdf GIS_Analysis_Hazard_Vulnerability_GIS6XXX_Syllabus_General.pdf					11/9/2018 11/9/2018 11/9/2018
College	Conditionall Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane	The College Curriculum Committee conditionally approves this request, with the following: 1) remove the last sentence of the course description.	12/2/2018
No document changes					
Department	Approved	CLAS - Geography 011609000	Jane Southworth		1/4/2019
No document changes					
College	Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane		1/12/2019
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			1/12/2019
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|New for request 13336

Info

Request: GIS 4XXX GIS Analysis of Hazard Vulnerability
Description of request: This request is for approval of a new GIS course to be taught within the Department of Geography.
Submitter: Kevin Ash kash78@ufl.edu
Created: 12/2/2018 10:12:35 PM
Form version: 3

Responses

Recommended Prefix GIS
Course Level 4
Number XXX
Category of Instruction Advanced
Lab Code C
Course Title GIS Analysis of Hazard Vulnerability
Transcript Title GIS Hazard Vulnerabil
Degree Type Baccalaureate

Delivery Method(s) On-Campus
Co-Listing Yes
Co-Listing Explanation This course is co-listed as GIS4XXX—an undergraduate course—and GIS6XXX which is a graduate course. While the two courses will meet together and complete similar assignments and exams, undergraduate and graduate students will be evaluated based on different criteria. Graduate students will be required to lead online and in-class discussions, complete a longer and more rigorous final project paper, deliver a longer and more comprehensive final project presentation, and graduate students will not be able to consult their notes during exams.
Effective Term Earliest Available
Effective Year Earliest Available
Rotating Topic? No
Repeatable Credit? No

Amount of Credit 3

S/U Only? No
Contact Type Regularly Scheduled
Weekly Contact Hours 3
Course Description Instruction on geographic and cartographic techniques for geospatial analysis of risk, vulnerability, and resilience using ArcGIS. Students learn to utilize physical and human geographic datasets for multiple hazard contexts including hydrometeorological, climatological, and geophysical hazards.
Prerequisites GIS 3043(C) or URP 4273(C)
Co-requisites None
Rationale and Placement in Curriculum This course will be unique in the UF catalog as it bridges Geographic Information Systems concepts and skills with both physical and human geographic concepts related to environmental hazards and disasters. This course progresses from physical hazard risk analysis and mapping to social vulnerability analysis and mapping, culminating in integrated risk/vulnerability geospatial assessment and construction and analysis of geospatial disaster resilience indicators. The course provides students both an opportunity to enhance their GIS and geospatial analysis knowledge and skills, while also learning how to synthesize physical and social sciences concepts & empirical data analysis methods to better understand interactions between humans and the environment.

The course will be at an advanced level in the existing undergraduate curriculum. It will benefit students who have taken GIS3043 Foundations in GIS (or equivalent GIS courses) as they will learn additional GIS concepts and skills in the GIS Analysis of Hazard Vulnerability course. It will also benefit students who have expertise in either physical or human geography but wish to explore

human-environment interactions in greater depth. The course will serve as an upper level elective course for undergraduate major and minors, including those seeking a Certificate in Geospatial Information Analysis and/or Meteorology and Climatology.

Course Objectives By the end of the course, students will:
1) Discover how the concepts of risk, vulnerability, and resilience are operationalized for geospatial analysis.
2) Demonstrate understanding of how risk and vulnerability indices are constructed and mapped using a GIS and how the indices and maps should be interpreted
3) Identify and use appropriate geospatial physical and socioeconomic datasets in risk and vulnerability analysis
4) Compare and contrast different geospatial analytic methodologies used in risk and vulnerability analysis
5) Apply basic and advanced geographic and geostatistical concepts in the context of disaster risk reduction efforts

Course Textbook(s) and/or Other Assigned Reading There is no course textbook, but students will have assigned readings for discussion both on Canvas and in class. The readings will be made available via Canvas. The reading list is provided below.

Week 1: Course introduction, no assigned reading

Week 2:
Elsner, J.B., R.E. Hodges, and T.H. Jagger, 2012. Spatial grids for hurricane climate research, Climate Dynamics, 39: 21-36.

Deng, Y., B. Wallace, D. Maassen, and J. Werner, 2016. A Few GIS Clarifications on Tornado Density Mapping, Journal of Applied Meteorology and Climatology, 55: 283- 296.

Week 3:
Tate, E., S.L. Cutter, and M. Berry, 2010. Integrated multihazard mapping, Environment and Planning B: Planning and Design, 37: 646-663.

Kappes, M.S., M. Keiler, K. von Elverfeldt, and T. Glade, 2012. Challenges of analyzing multi-hazard risk: a review, Natural Hazards, 64: 1925-1958.

Week 4:
Borden, K.A., and S.L. Cutter, 2008. Spatial patterns of natural hazards mortality in the United States, International Journal of Health Geographics, 7:64, doi:10.1186/1476-072X-7-64.

Hahn, D.J., E. Viaud, and R.B. Corotis, 2017. Multihazard Mapping of the United States, Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering, 3: 04016016.

Week 5:
Wong, D.W., and M. Sun, 2013. Handling Data Quality Information of Survey Data in GIS: A Case of Using the American Community Survey Data, Spatial Demography, 1: 3-16.

Folch, D.C., D. Arribas-Bel, J. Koschinsky, and S.E. Spielman, 2016. Spatial Variation in the Quality of American Community Survey Estimates, Demography, 53: 1535-1554.

Week 6:
Morrow, B.H., 1999. Identifying and Mapping Community Vulnerability, Disasters, 23: 1-18.

Flanagan, B.E., E.W. Gregory, E.J. Hallisey, J.L. Heitgerd, and B. Lewis, 2011. A Social Vulnerability Index for Disaster Management, Journal of Homeland Security and Emergency Management, 8: 3.

Week 7:
Cutter, S.L., B.J. Boruff, and W.L. Shirley, 2003. Social Vulnerability to Environmental Hazards, Social Science Quarterly, 84: 242-261.

Cutter, S.L., and C. Finch, 2008. Temporal and spatial changes in social vulnerability to natural hazards, Proceedings of the National Academy of Sciences, 105: 2301-2306.

Week 8: Midterm Exam, No Assigned Readings

Week 9:
Nelson, K.S., M.D. Abkowitz, and J.V. Camp, 2015. A method for creating high resolution maps of social vulnerability in the context of environmental hazards, Applied Geography, 63: 89-100.

Garcia, R.A.C., S.C. Oliveira, and J.L. Zezere, 2016. Assessing population exposure for landslide risk analysis using dasymetric cartography, Natural Hazards and Earth System Sciences, 16: 2769-2782.

Week 10:
Rufat, S., 2013. Spectroscopy of Urban Vulnerability, Annals of the Association of American Geographers, 103: 505-525.

Wood, N.J., J. Jones, S. Spielman, and M.C. Schmidtlein, 2015. Community clusters of tsunami vulnerability in the US Pacific Northwest, Proceedings of the National Academy of Sciences, DOI: https://doi.org/10.1073/pnas.1420309112.

Week 11:
Karagiorgos, K., T. Thaler, J. Hubl, F. Maris, and S. Fuchs, 2016. Multi-vulnerability analysis for flash flood risk management, Natural Hazards, 82: S63-S87.

Guillard-Goncalves, C., and J.L. Zezere, 2018. Combining Social Vulnerability and Physical Vulnerability to Analyse Landslide Risk at the Municipal Scale, Geosciences, 8: 294, DOI:10.3390/geosciences8080294.

Week 12:
Cadag, J.R.D., and J.C. Gaillard, 2012. Integrating knowledge and actions in disaster risk reduction: the contribution of participatory mapping, Area, 44: 100-109.

Hazarika, N., D. Barman, A.K. Das, A.K. Sarma, and S.B. Borah, 2018. Assessing and mapping flood hazard, vulnerability and risk in the Upper Brahmaputra River valley using stakeholders' knowledge and multicriteria evaluation (MCE), Journal of Flood Risk Management, 11: S700-S716.

Week 13:
Cutter, S.L., C.G. Burton, and C.T. Emrich, 2010. Disaster Resilience Indicators for Benchmarking Baseline Conditions, Journal of Homeland Security and Emergency Management, 7: Article 51.

Burton, C.G., 2015. A Validation of Metrics for Community Resilience to Natural Hazards and Disasters Using the Recovery from Hurricane Katrina as a Case Study, Annals of the Association of American Geographers, 105: 67-86.

Week 14:
Frazier, T.G., C.M. Thompson, and R.J. Dezzani, 2014. A framework for the development of the SERV model: A Spatially Explicit Resilience-Vulnerability model, Applied Geography, 51: 158-172.

Bakkensen, L.A., C. Fox-Lent, L.K. Read, and I. Linkov, 2017. Validating Resilience and Vulnerability Indices in the Context of Natural Disasters, Risk Analysis, 37: 982-1004.

Week 15: Students work on final project, no assigned readings

Week 16: Students present and submit final project, no assigned readings

Weekly Schedule of Topics Week 1: Course Introduction; Lab 1: Mapping Hazard Data Using ArcGIS Pro & UF Apps

Week 2: Physical Hazard Risk Mapping; Lab 2: Risk Mapping & the Modifiable Areal Unit Problem

Week 3: Multi-Hazard Risk Mapping; Lab 3: Multi-Hazard Risk Mapping for Florida

Week 4: Geospatial Analysis of Damage & Casualties; Lab 4: Damage and Denominators: Rate Mapping

Week 5: Demographic Geospatial Data & Visualizing Uncertainty; Lab 5: Visualizing Uncertainty in American Community Survey Data

Week 6: GIS-Based Social Vulnerability Analysis I; Lab 6: Building a Social Vulnerability Index for Florida Using the CDC Method

Week 7: GIS-Based Social Vulnerability Analysis II; Lab 7: Building a Social Vulnerability Index for Florida Using the SoVI Method.

Week 8: Midterm Exam; No lab assignment

Week 9: Dasymetric Mapping & Social Vulnerability Analysis; Lab 8: Dasymetric Social Vulnerability Analysis for Miami, Florida

Week 10: Clustering Methods & Social Vulnerability Analysis; Lab 9: Using MCLUST to Map Vulnerable Populations in Florida

Week 11: Risk/Vulnerability Integrated Analysis; Lab 10: An Integrated Risk & Vulnerability Exercise for Florida

Week 12: Vulnerability Analysis Using Participatory & Qualitative GIS Methods; Lab 11: Using Story Maps for Vulnerability Mapping

Week 13: GIS-Based Disaster Resilience Index I; Lab 12: Building a Disaster Resilience Index for the Southeastern USA Using the BRIC Method

Week 14: GIS-Based Disaster Resilience Index II; Lab 13: Building a Disaster Resilience Index for the Southeastern USA Using the SERV Method

Week 15: Individual Project Work; No lab assignment

Week 16: Student Project Presentations & Final Project Papers Due; No lab assignment

Links and Policies Attendance: Students are expected to attend each and every class period. Absences can be excused with proper documentation according to university policy. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Examination Policies and Reading Days: Course policies are consistent with University policies on during-term exams, final exams, reading days, and make-up exams. Students must notify the instructor as soon as possible in case of absence during an exam and provide documentation as to the reason for the absence. If deemed an excused absence, the student will be permitted a reasonable amount of time to make up the missed exam. More details can be found at https://catalog.ufl.edu/UGRD/academic-regulations/examination-policies-reading-days/.

Grading Policies for Assigning Grade Points: Information on current UF grading policies for assigning grade points may be found at https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Grades of "Incomplete": The current university policy concerning incomplete grades will be followed in this course. An incomplete grade may be assigned at the discretion of the instructor as an interim grade for a course in which you have completed a major portion of the course with a passing grade, been unable to complete course requirements before the end of the term because of extenuating circumstances, and obtained agreement from the instructor and arranged for resolution of the incomplete grade. Instructors are not required to assign incomplete grades.

Email: Each of you has a UF email address. It is vital that you maintain an active UF email account and that you check it often. This tentative syllabus is subject to change, and any changes will be transmitted to you via your UF email account and Canvas (see below). Students should email the instructor if they have questions about any of the lectures, readings, assignments, or exams. You should expect a response within about 24 hours during weekdays. On holidays or weekends, expect a response on the next business day.

Canvas: Course materials such as lectures, readings, the syllabus, and assignment instructions will be available through Canvas (https://elearning.ufl.edu). You will also find all due dates and grades on Canvas. Students must activate their UF GatorLink account in order to use Canvas. If you need help learning how to perform various tasks related to this course or other courses that utilize Canvas, please consult the above webpage. You may also contact the UF Computing Help Desk at (352) 392-HELP(4357) or helpdesk@ufl.edu.

Online Course Evaluation: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Recordings and Notes: It is not permitted to sell notes or recordings from this class without written consent of the instructor. Nor are students permitted to disseminate recordings of the instructor lecturing or post copies of assignments or exams on the internet.

Disabilities Statement:
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Academic Conduct Policy: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity.” You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or email to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 352-392-1601. Career assistance and counseling. http://www.crc.ufl.edu

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 352-392-2010 or 352-392-6420. General study skills and tutoring. http://teachingcenter.ufl.edu/

Writing Studio, 302 Tigert Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. http://writing.ufl.edu/writing-studio/

Student Complaints, https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

Health and Wellness Resources

U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.

Sexual Assault Recovery Servies (SARS), Student Health Care Center, 352-392-1161. More information on resources to help students with sexual violence issues at www.umatter.ufl.edu/sexual_violence

Sexual Harassment, Information on UF policies, awareness, reporting, and counseling at www.hr.ufl.edu/manager-resources/policies-2/sexual-harassment/

Counseling and Wellness Center, http://counseling.ufl.edu/cwc/Default.aspx, 352-392-1575;

University Police Department, 352-392-1111 (or 9-1-1 for emergencies). http://www.police.ufl.edu/

Grading Scheme Class Participation: Class participation will be evaluated based on two components. The first is attendance which will count for 5% of the final grade. Students are expected to attend the lecture and lab portion of the class for each of the 13 days of class during the semester. Students may be excused from absences with appropriate documentation according to the university policy. The other 5% of class participation will be discussion of the weekly readings on Canvas and in class. Students will be required to post their own summaries and critiques of the papers, post responses to classmates' comments, and discuss the papers further during class periods.

Lab Assignments: There will be 11 lab assignments which will amount to 40% of the final grade. The grade will be determined using the best 10 grades out of the 11 assignments, with the lowest grade being dropped. Lab assignments will be due one week after they are assigned, prior to the start of class on Monday morning. There will be a couple of exceptions to this general rule: Lab #1 will be due two weeks after assigned, and Lab #9 will be due 8 days after assigned.

Exams: In total, the two exams will account for 20% of the final grade, 10% each for the Midterm and Final exams. Both exams will be two-hour duration exams with two parts. The first part will be written and will cover concepts the students are learning in the course; the written portion will be short answer and essay questions. The second part of the exams will entail students demonstrating that they can perform analysis of risk and/or vulnerability using GIS, in a similar fashion to the lab assignments except that students will have roughly one hour to complete the given analysis.

Final Project: For the final project, students will use one or more of the GIS methods for analysis of hazard risk and vulnerability covered in the course to perform their own analysis for a location and hazard context of their choosing. The final project paper should be about 2500 words in length and include citations, data tables, and maps and graphs as appropriate. The class project will be worth 30% of the total grade. The majority of the points (25 out of the 30 percentage points) will be related to the paper which each student will write and turn in by December 5th. The remaining 5 percentage points will be for a 7 to 10 minute presentation given on December 3rd. More detailed instructions about the final project will be provided to students via Canvas and in class.

Assignments and Exams & Percent of Final Grade
Class Participation 10%
Lab Assignments 40%
Final Project

30%
Exam #1: Midterm 10%
Exam #2: Final

10%

Grading Scale (%)

92.5 – 100	A
89.5 – 92.4	A-
86.5 – 89.4	B+
82.5 – 86.4	B
79.5 – 82.4	B-
76.5 – 79.4	C+
72.5 – 76.4	C
69.5 – 72.5	C-
66.5 – 69.4	D+
62.5 – 66.4	D
59.5 – 62.4	D-
< 59.5	E

Instructor(s) Kevin Ash

GIS 4XXX: GIS Analysis of Hazard Vulnerability

Department of Geography

College of Liberal Arts & Sciences, University of Florida

COURSE SYLLABUS

Instructor:	Dr. Kevin Ash	Term:	Fall 2018
Office:	TUR 3128	Class Meeting Days:	Monday
Phone:	352-294-6956	Class Meeting Hours:	10:40 am – 1:40 pm
Email:	kash78@ufl.edu	Class Location:	TUR 3018
Office Hours:	Tues, Wed, Thurs 2-3 pm, or by appointment	Course Credits:	3 hours

I. Course Overview

In this course, students will learn fundamental concepts and widely used methodologies for assessment of hazard vulnerability using geospatial data and analysis techniques. They will benefit from lab assignments using ArcGIS Pro (primarily) and other geospatial and quantitative analysis software. This course will not use a simple hazard-by-hazard approach, but will integrate perspectives from the physical and social sciences to identify and describe risk, vulnerability, and disaster resilience with empirical data and real-world examples. This unique course will provide critical training and experience for students interested in hazards geography, GIS, emergency management, risk communication, or urban planning.

The course begins by reviewing key concepts relevant for geospatial analysis of risk and vulnerability such as the definitions of these terms and practical issues such as geographic scale and the modifiable areal and temporal unit problems. Then, we will investigate how different types of hazards are represented spatially and how these differences make multi-hazard mapping and analysis challenging. We will then discuss the advantages and pitfalls of using casualty and economic loss datasets, before introducing students to the wide array of socioeconomic datasets frequently used in social vulnerability and resilience analyses. Students will learn several different approaches and methodologies for social vulnerability mapping and analysis, and will learn how physical (risk) and social vulnerability analyses can be integrated into a single quantitative assessment. Students will also be exposed to participatory mapping approaches for risk and vulnerability, and learn how a disaster resilience index can be similar yet distinct from a vulnerability index.

NOTE: This course is co-listed with GIS6XXX which is a graduate course. While the two courses will meet together and complete similar assignments and exams, undergraduate and graduate students will be evaluated on different bases. Graduate students will be required to lead online and in-class discussions, complete a longer and more rigorous final project paper, deliver a longer and more comprehensive final project presentation, and graduate students will not be able to consult their notes during the exams.

II. Course Content Objectives

By the end of the course, students will:

- Discover how the concepts of risk, vulnerability, and resilience are operationalized for geospatial analyses.
- Demonstrate understanding of how risk and vulnerability indices are constructed and mapped using a GIS and how the indices and maps should be interpreted
- Identify and use appropriate geospatial physical and socioeconomic datasets in risk and vulnerability analyses
- Compare and contrast different geospatial analytic methodologies used in risk and vulnerability analyses
- Apply basic and advanced geographic and geostatistical concepts in the context of disaster risk reduction efforts

III. Student Learning Outcomes

Through the course assignments and exams, students will learn to:

- Define the terms risk, vulnerability, and resilience and operationalize these concepts with empirical spatial data
- Perform mapping and assessment of physical hazard risks associated with a variety of hazard types using GIS and geospatial analysis techniques
- Understand how the modifiable areal and temporal unit problems, as well as different data smoothing techniques, can influence conclusions about risk and vulnerability in quantitative and geospatial analysis
- Work with data that contain margins of error and visualize uncertainty in maps
- Download, combine, and map secondary socioeconomic data in a social vulnerability index
- Analyze and map data using multivariate statistics
- Map social and physical data using dasymetric techniques
- Combine and map physical hazard and socioeconomic data for a comprehensive risk and vulnerability analysis
- Communicate analysis findings in written, verbal, cartographic, and graphical formats

IV. Materials and Supplies: Laptop Computer

This course will be held in TUR 3018, which is a studio classroom with no computer terminals. Students must provide their own laptop computer on which to work on assignments and exams during and/or outside of class. Any required software (such as ArcGIS Pro) will be available on students' laptops through UF Apps at https://info.apps.ufl.edu or through student versions provided by the instructor.

V. Required Texts and Useful Online Resources

There is no required textbook for this course. The instructor will assign readings on a weekly basis and these will be available via Canvas. Citations for the required readings are provided at the end of this document.

VI. Course Format, Activities, and Basis for Evaluation

The class will meet once per week for a three hour time block on Mondays from 10:40 am to 1:40 pm. The first hour of each class period will consist of a presentation by the instructor about key concepts related to the week's topic. The presentations will be made available to students via Canvas on Monday mornings before class begins. This will give students the opportunity to download the presentation to their own laptop and write notes directly into the file during the presentation. There will be a 30 minute break (about 11:30 am to 12:00 pm) after the presentation during which students and the instructor can eat lunch. We will reconvene at 12:00 pm for the lab portion of the class. During the lab period, we will begin by going through an example GIS lab exercise where the instructor will demonstrate and guide students through each step. This example exercise will take approximately 40-50 minutes. After the example exercise is completed, students will then work on the weekly lab assignment which will be similar to the example GIS exercise. The GIS lab assignment will require students to complete several tasks independently by using what they have learned from the presentation and example exercise. Students are expected to use the remaining 40-50 minutes of the lab period to work on the GIS lab assignment. The instructor will standby to answer questions, troubleshoot software difficulties, and work individually with students. The GIS lab assignment will then be due by the start of class the following Monday (with a couple of exceptions as noted in the weekly schedule provided in this syllabus).

Evaluation and Grading

Class Participation: Class participation will be evaluated based on two components. The first is attendance which will count for 5% of the final grade. Students are expected to attend the lecture and lab portion of the class for each of the 13 days of class during the semester. Students may be excused from absences with appropriate documentation according to the university policy (more information provided in Section IX below). The other 5% of class participation will be discussion of the weekly readings on Canvas and in class. Students will be required to post their own summaries and critiques of the papers, post responses to classmates' comments, and discuss the papers further during class periods.

Lab Assignments: There will be 13 lab assignments which will amount to 40% of the final grade. The grade will be determined using the best 12 grades out of the 13 assignments, with the lowest grade being dropped. Lab assignments will be due one week after they are assigned.

Exams: In total, the two exams will account for 20% of the final grade, 10% each for the Midterm and Final exams. Both exams will be two-hour duration exams with two parts. The first part will be written and will cover concepts the students are learning in the course; the written portion will be short answer and essay questions. The second part of the exams will entail students demonstrating that they can perform analysis of risk and/or vulnerability using GIS, in a similar fashion to the lab assignments except that students will have roughly one hour to complete the given analysis. Undergraduate students will be permitted to consult their written notes during the exams.

Final Project: For the final project, students will use one or more of the GIS methods for analysis of hazard risk and vulnerability covered in the course to perform their own analysis for a location and hazard context of their choosing. The final project paper should be about 2500 words in length and include citations, data tables, and maps and graphs as appropriate. The class project will be worth 30% of the total grade. The majority of the points (25 out of the 30 percentage points) will be related to the paper which each student will write and turn in by December 5th. The remaining 5 percentage points will be for an 8 minute presentation given on December 3rd. More detailed instructions about the final project will be provided to students via Canvas and in class.

Assignments and Exams	Percent of Final Grade
Class Participation	10%
Lab Assignments	40%
Final Project	30%
Exam #1: Midterm	10%
Exam #2: Final	10%

Grading Scale (%)	
92.5 – 100	A
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82.5 – 86.4	B
79.5 – 82.4	B-
76.5 – 79.4	C+
72.5 – 76.4	C
69.5 – 72.5	C-
66.5 – 69.4	D+
62.5 – 66.4	D
59.5 – 62.4	D-
< 59.5	E

VII. **Important Dates to Remember:** The due dates below are tentative and can be changed at the discretion of the instructor.

Drop/Add Ends:	Tues, Aug 28th 2018
No Class, Labor Day*	Mon, Sep 3rd 2018
Midterm Exam	**Mon, Oct 15th 2018**
No Class, Fall Break, Homecoming	Fri, Nov 2nd 2018
No Class, Veterans Day*	Mon, Nov 12th 2018
No Class, Thanksgiving Break	Wed-Fri, Nov 21-23rd 2018
Final Project Due	**Wed, Dec 5th 2018**
Reading Days	Thurs-Fri, Dec 6-7th 2018
Final Exam	**Tues, Dec 11th 2018**

Fall 2018 Grades Visible on https://one.uf.edu/dashboard/ Wed, Dec 19th 2018

VIII. Weekly Topic Schedule, Assignments, and Exams (Schedule is provisional and subject to change)

Date	Day	Class Topics & Assignments	Read Before Class
Week 1	M	Course Introduction; Lab #1	None
Week 2	M	Physical Hazard Risk Mapping; Lab #2; Lab #1 due	Elsner et al. 2012; Deng et al. 2016
Week 3	M	Multi-Hazard Risk Mapping; Lab #3; Lab #2 due	Tate et al. 2011; Kappes et al. 2012
Week 4	M	Geospatial Analysis of Damage & Casualties; Lab #4; Lab #3 due	Borden & Cutter 2008; Hahn et al. 2017
Week 5	M	Demographic Geospatial Data & Visualizing Uncertainty; Lab #5; Lab #4 due	Wong & Sun 2013; Folch et al. 2016
Week 6	M	GIS-Based Social Vulnerability Analysis I; Lab #6; Lab #5 due	Morrow 1999; Flanagan et al. 2011
Week 7	M	GIS-Based Social Vulnerability Analysis II; Lab #7; Lab #6 due	Cutter et al. 2003; Cutter & Finch 2008
Week 8	M	***Midterm Exam; Lab #7 due***	
Week 9	M	Dasymetric Mapping & Social Vulnerability Analysis; Lab #8	Nelson et al. 2015; Garcia et al. 2016
Week 10	M	Clustering Methods & Social Vulnerability Analysis; Lab #9; Lab #8 due	Rufat 2013; Wood et al. 2015
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Cutter, S.L., C.G. Burton, and C.T. Emrich, 2010. Disaster Resilience Indicators for Benchmarking Baseline Conditions, *Journal of Homeland Security and Emergency Management*, 7: Article 51.

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Elsner, J.B., R.E. Hodges, and T.H. Jagger, 2012. Spatial grids for hurricane climate research, *Climate Dynamics*, 39: 21-36.

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Garcia, R.A.C., S.C. Oliveira, and J.L. Zezere, 2016. Assessing population exposure for landslide risk analysis using dasymetric cartography, *Natural Hazards and Earth System Sciences*, 16: 2769-2782.

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Hahn, D.J., E. Viaud, and R.B. Corotis, 2017. Multihazard Mapping of the United States, *Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering*, 3: 04016016.

Hazarika, N., D. Barman, A.K. Das, A.K. Sarma, and S.B. Borah, 2018. Assessing and mapping flood hazard, vulnerability and risk in the Upper Brahmaputra River valley using stakeholders' knowledge and multicriteria evaluation (MCE), *Journal of Flood Risk Management*, 11: S700-S716.

Karagiorgos, K., T. Thaler, J. Hubl, F. Maris, and S. Fuchs, 2016. Multi-vulnerability analysis for flash flood risk management, *Natural Hazards*, 82: S63-S87.

Kappes, M.S., M. Keiler, K. von Elverfeldt, and T. Glade, 2012. Challenges of analyzing multi-hazard risk: a review, *Natural Hazards*, 64: 1925-1958.

Morrow, B.H., 1999. Identifying and Mapping Community Vulnerability, *Disasters*, 23: 1-18.

Nelson, K.S., M.D. Abkowitz, and J.V. Camp, 2015. A method for creating high resolution maps of social vulnerability in the context of environmental hazards, *Applied Geography*, 63: 89-100.

Rufat, S., 2013. Spectroscopy of Urban Vulnerability, *Annals of the Association of American Geographers*, 103: 505-525.

Tate, E., S.L. Cutter, and M. Berry, 2010. Integrated multihazard mapping, *Environment and Planning B: Planning and Design*, 37: 646-663.

Wong, D.W., and M. Sun, 2013. Handling Data Quality Information of Survey Data in GIS: A Case of Using the American Community Survey Data, *Spatial Demography*, 1: 3-16.

Wood, N.J., J. Jones, S. Spielman, and M.C. Schmidtlein, 2015. Community clusters of tsunami vulnerability in the US Pacific Northwest, *Proceedings of the National Academy of Sciences,* DOI: https://doi.org/10.1073/pnas.1420309112.

GIS 6XXX: GIS Analysis of Hazard Vulnerability

Department of Geography

College of Liberal Arts & Sciences, University of Florida

COURSE SYLLABUS

Instructor:	Dr. Kevin Ash	Term:	Fall 2018
Office:	TUR 3128	Class Meeting Days:	Monday
Phone:	352-294-6956	Class Meeting Hours:	10:40 am – 1:40 pm
Email:	kash78@ufl.edu	Class Location:	TUR 3018
Office Hours:	Tues, Wed, & Thurs 2-3 pm, or by appointment	Course Credits:	3 hours

I. Course Overview

In this course, students will learn fundamental concepts and widely used methodologies for assessment of hazard vulnerability using geospatial data and analysis techniques. They will benefit from lab assignments using ArcGIS Pro (primarily) and other geospatial and quantitative analysis software. This course will not use a simple hazard-by-hazard approach, but will integrate perspectives from the physical and social sciences to identify and describe risk, vulnerability, and disaster resilience with empirical data and real-world examples. This unique course will provide critical training and experience for students interested in hazards geography, GIS, emergency management, risk communication, or urban planning.

The course begins by reviewing key concepts relevant for geospatial analysis of risk and vulnerability such as the definitions of these terms and practical issues such as geographic scale and the modifiable areal and temporal unit problems. Then, we will investigate how different types of hazards are represented spatially and how these differences make multi-hazard mapping and analysis challenging. We will then discuss the advantages and pitfalls of using casualty and economic loss datasets, before introducing students to the wide array of socioeconomic datasets frequently used in social vulnerability and resilience analyses. Students will learn several different approaches and methodologies for social vulnerability mapping and analysis, and will learn how physical (risk) and social vulnerability analyses can be integrated into a single quantitative assessment. Students will also be exposed to participatory mapping approaches for risk and vulnerability, and learn how a disaster resilience index can be similar yet distinct from a vulnerability index.

NOTE: This course is co-listed with GIS4XXX which is an undergraduate course. While the two courses will meet together and complete similar assignments and exams, undergraduate and graduate students will be evaluated on different bases. Graduate students will be required to lead online and in-class discussions, complete a longer and more rigorous final project paper, deliver a longer and more comprehensive final project presentation, and graduate students will not be able to consult their notes during the exams.

II. Course Content Objectives

By the end of the course, students will:

- Discover how the concepts of risk, vulnerability, and resilience are operationalized for geospatial analyses.
- Demonstrate understanding of how risk and vulnerability indices are constructed and mapped using a GIS and how the indices and maps should be interpreted
- Identify and use appropriate geospatial physical and socioeconomic datasets in risk and vulnerability analyses
- Compare and contrast different geospatial analytic methodologies used in risk and vulnerability analyses
- Apply basic and advanced geographic and geostatistical concepts in the context of disaster risk reduction efforts

III. Student Learning Outcomes

Through the course assignments and exams, students will learn to:

- Define the terms risk, vulnerability, and resilience and operationalize these concepts with empirical spatial data
- Perform mapping and assessment of physical hazard risks associated with a variety of hazard types using GIS and geospatial analysis techniques
- Understand how the modifiable areal and temporal unit problems, as well as different data smoothing techniques, can influence conclusions about risk and vulnerability in quantitative and geospatial analysis
- Work with data that contain margins of error and visualize uncertainty in maps
- Download, combine, and map secondary socioeconomic data in a social vulnerability index
- Analyze and map data using multivariate statistics
- Map social and physical data using dasymetric techniques
- Combine and map physical hazard and socioeconomic data for a comprehensive risk and vulnerability analysis
- Communicate analysis findings in written, verbal, cartographic, and graphical formats
- Give an oral presentation similar to what would be given at an academic conference

IV. Materials and Supplies: Laptop Computer

This course will be held in TUR 3018, which is a studio classroom with no computer terminals. Students must provide their own laptop computer on which to work on assignments and exams during and/or outside of class. Any required software (such as ArcGIS Pro) will be available on students' laptops through UF Apps at https://info.apps.ufl.edu or through student versions provided by the instructor.

V. Required Texts and Useful Online Resources

There is no required textbook for this course. The instructor will assign readings on a weekly basis and these will be available via Canvas. Citations for the required readings are provided at the end of this document.

VI. Course Format, Activities, and Basis for Evaluation

The class will meet once per week for a three-hour time block on Mondays from 10:40 am to 1:40 pm. The first hour of each class period will consist of a presentation by the instructor about key concepts related to the week's topic. The presentations will be made available to students via Canvas on Monday mornings before class begins. This will give students the opportunity to download the presentation to their own laptop and write notes directly into the file during the presentation. There will be a 30 minute break (about 11:30 am to 12:00 pm) after the presentation during which students and the instructor can eat lunch. We will reconvene at 12:00 pm for the lab portion of the class. During the lab period, we will begin by going through an example GIS lab exercise where the instructor will demonstrate and guide students through each step. This example exercise will take approximately 40-50 minutes. After the example exercise is completed, students will then work on the weekly lab assignment which will be similar to the example GIS exercise. The GIS lab assignment will require students to complete several tasks independently by using what they have learned from the presentation and example exercise. Students are expected to use the remaining 40-50 minutes of the lab period to work on the GIS lab assignment. The instructor will standby to answer questions, troubleshoot software difficulties, and work individually with students. The GIS lab assignment will then be due by the start of class the following Monday (with a couple of exceptions as noted in the weekly schedule provided in this syllabus).

Evaluation and Grading

Class Participation: Class participation will be evaluated based on two components. The first is attendance which will count for 5% of the final grade. Students are expected to attend the lecture and lab portion of the class for each of the 16 days of class during the semester. Students may be excused from absences with appropriate documentation according to the university policy (more information provided in Section IX below). The other 10% of class participation will be based on discussion of the weekly readings on Canvas and in class. Students will be required to post their own summaries and critiques of the papers, post responses to classmates' comments, and discuss the papers further during class periods. Graduate students will be responsible for leading the online and in-class discussion at least once during the semester.

Lab Assignments: There will be 13 lab assignments which will amount to 25% of the final grade. The grade will be determined using the best 12 grades out of the 13 assignments, with the lowest grade being dropped. Lab assignments will be due one week after they are assigned.

Exams: In total, the two exams will account for 20% of the final grade, 10% each for the Midterm and Final exams. Both exams will be two-hour duration exams with two parts. The first part will be written and will cover concepts the students are learning in the course; the written portion will be short answer and essay questions. The second part of the exams will entail students demonstrating that they can perform analysis of risk and/or vulnerability using GIS, in a similar fashion to the lab assignments except that students will have roughly one hour to complete the given analysis. Graduate students will NOT be permitted to consult any notes during the exams.

Final Project: For the final project, students will use one or more of the GIS methods for analysis of hazard risk and vulnerability covered in the course to perform their own analysis for a location and hazard context of their choosing. The final project paper should be about 3500 words in length and include citations, data tables, and maps and graphs as appropriate. The class project will be worth 40% of the total grade. The majority of the points (30 out of the 40 percentage points) will be related to the paper which each student will write and turn in by December 5th. The remaining 10 percentage points will be for a 15 minute presentation given on December 3rd. More detailed instructions about the final project will be provided to students via Canvas and in class.

Assignments and Exams	**Percent of Final Grade**
Class Participation	15%
Lab Assignments	25%
Final Project	40%
Exam #1: Midterm	10%
Exam #2: Final	10%

Grading Scale (%)	
92.5 – 100	A
89.5 – 92.4	A-
86.5 – 89.4	B+
82.5 – 86.4	B
79.5 – 82.4	B-
76.5 – 79.4	C+
72.5 – 76.4	C
69.5 – 72.5	C-
66.5 – 69.4	D+
62.5 – 66.4	D
59.5 – 62.4	D-
< 59.5	E

VII. **Important Dates to Remember:** The due dates below are tentative and can be changed at the discretion of the instructor.

Drop/Add Ends:	Tues, Aug 28th 2018
No Class, Labor Day*	Mon, Sep 3rd 2018
Midterm Exam	**Mon, Oct 15th 2018**
No Class, Fall Break, Homecoming	Fri, Nov 2nd 2018
No Class, Veterans Day*	Mon, Nov 12th 2018
No Class, Thanksgiving Break	Wed-Fri, Nov 21-23rd 2018
Final Project Presentations	**Mon, Dec 3rd 2018**
Final Project Due	**Wed, Dec 5th 2018**
Reading Days	Thurs-Fri, Dec 6-7th 2018
Final Exam	**Tues, Dec 11th 2018**

Fall 2018 Grades Visible on https://one.uf.edu/dashboard/ Wed, Dec 19th 2018

VIII. Weekly Topic Schedule, Assignments, and Exams (Schedule is provisional and subject to change)

Date	Day	Class Topics & Assignments	Read Before Class
Week 1	M	Course Introduction; Lab #1	None
Week 2	M	Physical Hazard Risk Mapping; Lab #2; Lab #1 due	Elsner et al. 2012; Deng et al. 2016
Week 3	M	Multi-Hazard Risk Mapping; Lab #3; Lab #2 due	Tate et al. 2011; Kappes et al. 2012
Week 4	M	Geospatial Analysis of Damage & Casualties; Lab #4; Lab #3 due	Borden & Cutter 2008; Hahn et al. 2017
Week 5	M	Demographic Geospatial Data & Visualizing Uncertainty; Lab #5; Lab #4 due	Wong & Sun 2013; Folch et al. 2016
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Week 7	M	GIS-Based Social Vulnerability Analysis II; Lab #7; Lab #6 due	Cutter et al. 2003; Cutter & Finch 2008
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UCC: External Consultations

External Consultation Results (departments with potential overlap or interest in proposed course, if any)

Department	Name and Title
Urban and Regional Planning	Kristin Larsen, Professor and Director, School of Landscape Arc
Phone Number	**E-mail**
352-294-1482	klarsen@ufl.edu

Comments

Our faculty who specialize in planning technology, including GIS applications, support your proposal. In fact, we would like to join an undergraduate and graduate URP class to your course, when you teach it, so students seeking a URP course can take your course.

Department	Name and Title
Sustainability Studies	Leslie Paul Thiele, Professor and Director
Phone Number	**E-mail**
352-273-2380	thiele@ufl.edu

Comments

I write to support the creation of a new Geography course, GIS 4XXX/6XXX: GIS Analysis of Hazard Vulnerability, which, when created, I will submit to the UCC as a new elective in the Cluster D electives for Sustainability Studies students.

The new course would be a welcome addition to the Cluster, and a benefit to many of our majors.

Department	Name and Title
School of Natural Resources and Environment	Tom Frazer, Professor and Director
Phone Number	**E-mail**
352-392-9230	frazer@ufl.edu

Comments

Note from Kevin Ash: I contacted Tom Frazer with SNRE as well as David Foster with Geology and never received a reply from either contact. We take the lack of a reply to mean that these respective departments do not object to this new course in Geography.