

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	5/6/2019 11:06:45 AM
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
No document changes					
College	Conditionally 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	Recycled	PV - University Curriculum Committee (UCC)	Casey Griffith	Please provide external consults with responses from consulted units. Please provide description of how Graduate students will be graded for leading discussion/class.	2/19/2019
No document changes					
College	Recycled	CLAS - College of Liberal Arts and Sciences	Joseph Spillane	Once these consults have been obtained, add these to the submission and send back to the college. I am happy to assist with consults-- Joe Spillane	2/21/2019
No document changes					
Department	Approved	CLAS - Geography 011609000	Jane Southworth		4/12/2019
UCC_Ext_Consult_GIS4XXX_GIS_Analysis_Hazard_Vulnerability.pdf					3/6/2019
College	Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane		4/22/2019
No document changes					

Step	Status	Group	User	Comment	Updated
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			4/22/2019
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: 5/6/2019 11:05:32 AM

Form version: 5

Responses

Recommended Prefix

Enter the three letter code indicating placement of course within the discipline (e.g., POS, ATR, ENC). Note that for new course proposals, the State Common Numbering System (SCNS) may assign a different prefix.

Response:
GIS

Course Level

Select the one digit code preceding the course number that indicates the course level at which the course is taught (e.g., 1=freshman, 2=sophomore, etc.).

Response:
4

Number

Enter the three digit code indicating the specific content of the course based on the SCNS taxonomy and course equivalency profiles. For new course requests, this may be XXX until SCNS assigns an appropriate number.

Response:
XXX

Category of Instruction

Indicate whether the course is introductory, intermediate or advanced. Introductory courses are those that require no prerequisites and are general in nature. Intermediate courses require some prior preparation in a related area. Advanced courses require specific competencies or knowledge relevant to the topic prior to enrollment.

Response:
Advanced

- 1000 and 2000 level = Introductory undergraduate
- 3000 level = Intermediate undergraduate
- 4000 level = Advanced undergraduate
- 5000 level = Introductory graduate
- 6000 level = Intermediate graduate
- 7000 level = Advanced graduate

4000/5000 and 4000/6000 levels = Joint undergraduate/graduate (these must be approved by the UCC and the Graduate Council)

Lab Code

Enter the lab code to indicate whether the course is lecture only (None), lab only (L), or a combined lecture and lab (C).

Response:
None

Course Title

Enter the title of the course as it should appear in the Academic Catalog.

Response:
GIS Analysis of Hazard Vulnerability

Transcript Title

Enter the title that will appear in the transcript and the schedule of courses. Note that this must be limited to 21 characters (including spaces and punctuation).

Response:
GIS Hazard Vulnerabil

Degree Type

Select the type of degree program for which this course is intended.

Response:
Baccalaureate

Delivery Method(s)

Indicate all platforms through which the course is currently planned to be delivered.

Response:
On-Campus

Co-Listing

Will this course be jointly taught to undergraduate, graduate, and/or professional students?

Response:
Yes

Co-Listing Explanation

Please detail how coursework differs for undergraduate, graduate, and/or professional students. Additionally, please upload a copy of both the undergraduate and graduate syllabus to the request in .pdf format.

Response:
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

Select the requested term that the course will first be offered. Selecting "Earliest" will allow the course to be active in the earliest term after SCNS approval. If a specific term and year are selected, this should reflect the department's best projection. Courses cannot be implemented retroactively, and therefore the actual effective term cannot be prior to SCNS approval, which must be obtained prior to the first day of classes for the effective term. SCNS approval typically requires 2 to 6 weeks after approval of the course at UF.

Response:
Earliest Available

Effective Year

Select the requested year that the course will first be offered. See preceding item for further information.

Response:
Earliest Available

Rotating Topic?

Select "Yes" if the course can have rotating (varying) topics. These course titles can vary by topic in the Schedule of Courses.

Response:
No

Repeatable Credit?

Select "Yes" if the course may be repeated for credit. If the course will also have rotating topics, be sure to indicate this in the question above.

Response:
No

Amount of Credit

Select the number of credits awarded to the student upon successful completion, or select "Variable" if the course will be offered with variable credit and then indicate the minimum and maximum credits per section. Note that credit hours are regulated by Rule 6A-10.033, FAC. If you select "Variable" for the amount of credit, additional fields will appear in which to indicate the minimum and maximum number of total credits.

Response:
3

S/U Only?

Select "Yes" if all students should be graded as S/U in the course. Note that each course must be entered into the UF curriculum inventory as either letter-graded or S/U. A course may not have both options. However, letter-graded courses allow students to take the course S/U with instructor permission.

Response:

No

Contact Type

Select the best option to describe course contact type. This selection determines whether base hours or headcount hours will be used to determine the total contact hours per credit hour. Note that the headcount hour options are for courses that involve contact between the student and the professor on an individual basis.

Response:

Regularly Scheduled

- Regularly Scheduled [base hr]
- Thesis/Dissertation Supervision [1.0 headcount hr]
- Directed Individual Studies [0.5 headcount hr]
- Supervision of Student Interns [0.8 headcount hr]
- Supervision of Teaching/Research [0.5 headcount hr]
- Supervision of Cooperative Education [0.8 headcount hr]

Contact the Office of Institutional Planning and Research (352-392-0456) with questions regarding contact type.

Weekly Contact Hours

Indicate the number of hours instructors will have contact with students each week on average throughout the duration of the course.

Response:

3

Course Description

Provide a brief narrative description of the course content. This description will be published in the Academic Catalog and is limited to 50 words or fewer. See course description guidelines.

Response:

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

Indicate all requirements that must be satisfied prior to enrollment in the course. Prerequisites will be automatically checked for each student attempting to register for the course. The prerequisite will be published in the Academic Catalog and must be formulated so that it can be enforced in the registration system. Please note that upper division courses (i.e., intermediate or advanced level of instruction) must have proper prerequisites to target the appropriate audience for the course.

Response:

GIS 3043(C) or URP 4273(C)

Completing Prerequisites on UCC forms:

- Use "&" and "or" to conjoin multiple requirements; do not use commas, semicolons, etc.
- Use parentheses to specify groupings in multiple requirements.
- Specifying a course prerequisite (without specifying a grade) assumes the required passing grade is D-. In order to specify a different grade, include the grade in parentheses immediately after the course number. For example, "MAC 2311(B)" indicates that students are required to obtain a grade of B in Calculus I. MAC2311 by itself would only require a grade of D-.

- Specify all majors or minors included (if all majors in a college are acceptable the college code is sufficient).
- "Permission of department" is always an option so it should not be included in any prerequisite or co-requisite.

Example: A grade of C in HSC 3502, passing grades in HSC 3057 or HSC 4558, and major/minor in PHHP should be written as follows:

HSC 3502(C) & (HSC 3057 or HSC 4558) & (HP college or (HS or CMS or DSC or HP or RS minor))

Co-requisites

Indicate all requirements that must be taken concurrently with the course. Co-requisites are not checked by the registration system.

Response:

None

Rationale and Placement in Curriculum

Explain the rationale for offering the course and its place in the curriculum.

Response:

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

Describe the core knowledge and skills that student should derive from the course. The objectives should be both observable and measurable.

Response:

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

Enter the title, author(s) and publication date of textbooks and/or readings that will be assigned. Please provide specific examples to evaluate the course.

Response:

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. Schmidlein, 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

Provide a projected weekly schedule of topics. This should have sufficient detail to evaluate how the course would meet current curricular needs and the extent to which it overlaps with existing courses at UF.

Response:

Week 1: Course Introduction; Assignment 1: Mapping Hazard Data Using ArcGIS Pro & UF Apps

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

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

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

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

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

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

Week 8: Midterm Exam; No assignment

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

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

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

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

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

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

Week 15: Individual Project Work; No assignment

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

Links and Policies

*Consult the syllabus policy page for a list of required and recommended links to add to the syllabus. Please list the links and any additional policies that will be added to the course syllabus.
Please see: syllabus.ufl.edu for more information*

Response:

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 Services (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

List the types of assessments, assignments and other activities that will be used to determine the course grade, and the percentage contribution from each. This list should have sufficient detail to evaluate the course rigor and grade integrity. Include details about the grading rubric and percentage breakdowns for determining grades.

Response:

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 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 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 and discuss the papers further during class periods. An evaluation rubric is provided in the syllabus.

Assignments: There will be 13 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. 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 weekly 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%

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)

Enter the name of the planned instructor or instructors, or "to be determined" if instructors are not yet identified.

Response:

Kevin Ash

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 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 three hour period will be a mix of lecture, discussion of assigned readings, review of weekly assignments, instructor demonstrations of course-relevant tasks and techniques using ArcGIS Pro, and a question/answer period for each week's new GIS assignment.

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 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 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 and discuss the papers further during class periods. An evaluation rubric is provided below.

Rubric for Evaluation: Online Readings Summaries/Critiques

Task: Write a 300-500 word summary and critique of the weekly assigned readings and submit it via Canvas prior to class. Consult the rubric below to make sure you include all required elements to receive full credit.

(Adapted from two sources: Solan & Linardopoulos 2011, http://jolt.merlot.org/vol7no4/linardopoulos_1211.htm; Reflection/Discussion Critique Rubric, <http://www.rcampus.com/rubricshowc.cfm?sp=yes&code=D97AAC&>.)

Evaluation Category	Standards for Excellent Work	Points	Instructor Comments
Summary of Key Concepts	-Demonstrate comprehension of key concepts from readings -Recognize & define key concepts in summary	/4	

	-Use terms & concepts appropriately in context		
Evaluation & Synthesis of Key Concepts	-Construct generalized judgments and/or arguments about key concepts in readings -Support arguments using specific instances or examples from the readings	/6	
Critique Strategies	-Employ one or more critique strategies such as: <ul style="list-style-type: none"> ▪ Compare/contrast between readings ▪ Deconstruction of language or logic ▪ Identification of methodological shortcomings 	/6	
Writing & Communication Proficiency	-Organize writing with clear structure: <ul style="list-style-type: none"> ▪ Introduction ▪ Body ▪ Conclusion -Avoid spelling, grammar, syntax, punctuation, or other writing errors	/4	

Assignments: There will be 13 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. 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 weekly 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%
Assignments	40%
Final Project	30%
Exam #1: Midterm	10%

Exam #2: Final	10%
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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 28 th 2018
No Class, Labor Day*	Mon, Sep 3 rd 2018
Midterm Exam	Mon, Oct 15th 2018
No Class, Fall Break, Homecoming	Fri, Nov 2 nd 2018
No Class, Veterans Day*	Mon, Nov 12 th 2018
No Class, Thanksgiving Break	Wed-Fri, Nov 21-23 rd 2018
Final Project Due	Wed, Dec 5th 2018
Reading Days	Thurs-Fri, Dec 6-7 th 2018
Final Exam	Tues, Dec 11th 2018
Fall 2018 Grades Visible on https://one.uf.edu/dashboard/	Wed, Dec 19 th 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; Assignment #1	None
Week 2	M	Physical Hazard Risk Mapping; Assignment #2; Assignment #1 due	Elsner et al. 2012; Deng et al. 2016
Week 3	M	Multi-Hazard Risk Mapping; Assignment #3; Assignment #2 due	Tate et al. 2011; Kappes et al. 2012
Week 4	M	Geospatial Analysis of Damage & Casualties; Assignment #4; Assignment #3 due	Borden & Cutter 2008; Hahn et al. 2017
Week 5	M	Demographic Geospatial Data & Visualizing Uncertainty; Assignment #5; Assignment #4 due	Wong & Sun 2013; Folch et al. 2016
Week 6	M	GIS-Based Social Vulnerability Analysis I; Assignment #6; Assignment #5 due	Morrow 1999; Flanagan et al. 2011
Week 7	M	GIS-Based Social Vulnerability Analysis II; Assignment #7; Assignment #6 due	Cutter et al. 2003; Cutter & Finch 2008
Week 8	M	Midterm Exam; Assignment #7 due	
Week 9	M	Dasymetric Mapping & Social Vulnerability Analysis; Assignment #8	Nelson et al. 2015; Garcia et al. 2016
Week 10	M	Clustering Methods & Social Vulnerability Analysis;	Rufat 2013; Wood et al. 2015

		Assignment #9; Assignment #8 due	
Week 11	M	Risk/Vulnerability Integrated Analysis; Assignment #10; Assignment #9 due	Karagiorgos et al. 2016; Gaillard-Goncalves & Zezere 2018
Week 12	M	Vulnerability Analysis Using Participatory & Qualitative GIS Methods; Assignment #11; Assignment #10 due	Cadag & Gaillard 2012; Hazarika et al. 2016
Week 13	M	GIS-Based Disaster Resilience Index I; Assignment #12; Assignment #11 due	Cutter et al. 2010; Burton 2015
Week 14	M	GIS-Based Disaster Resilience Index II; Assignment #13; Assignment #12 due	Frazier et al. 2014; Bakkensen et al. 2017
Week 15	M	Students Work on Projects; Assignment #13 due	None
Week 16	M	<i>Final Project Presentations and Final Project Papers Due</i>	
Exam Week	?	<i>Final Exam Date/Time TBA</i>	

IX. Course Policies: Attendance, Make-Ups, and Grades

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.

X. Course Policies: Technology and Media

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. The instructor will reasonably expect similar time frames for responses to emails sent to students.

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.

XI. Course Policies: Student Expectations

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>.

XII. Campus Resources for Students:

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 Services (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/>

XIII. Assigned Readings Citations:

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.

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.

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.

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.

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.

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.

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.

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

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.

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.

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.

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.

- 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.
- 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. Schmidlein, 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>.

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 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 three hour period will be a mix of lecture, discussion of assigned readings, review of weekly assignments, instructor demonstrations of course-relevant tasks and techniques using ArcGIS Pro, and a question/answer period for each week's new GIS assignment.

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 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 and discuss the papers further during class periods; this will constitute half (5 percentage points) of the 10% participation grade constituted by discussion. An evaluation rubric is provided below. For the other 5 percentage points of the 10% based on discussion, graduate students will be responsible for leading the online and in-class discussion at least once during the semester. A rubric for evaluation of discussion leaders is also provided below.

Rubric for Evaluation: Online Readings Summaries/Critiques

Task: Write a 300-500 word summary and critique of the weekly assigned readings and submit it via Canvas prior to class.

Consult the rubric below to make sure you include all required elements to receive full credit.

(Adapted from two sources: Solan & Linardopoulos 2011, http://jolt.merlot.org/vol7no4/linardopoulos_1211.htm; Reflection/Discussion Critique Rubric, <http://www.rcampus.com/rubricshowc.cfm?sp=yes&code=D97AAC&>.)

Evaluation Category	Standards for Excellent Work	Points	Instructor Comments
Summary of Key Concepts	<ul style="list-style-type: none"> -Demonstrate comprehension of key concepts from readings -Recognize & define key concepts in summary -Use terms & concepts appropriately in context 	/4	
Evaluation & Synthesis of Key Concepts	<ul style="list-style-type: none"> -Construct generalized judgments and/or arguments about key concepts in readings -Support arguments using specific instances or examples from the readings 	/6	
Critique Strategies	<ul style="list-style-type: none"> -Employ one or more critique strategies such as: <ul style="list-style-type: none"> ▪ Compare/contrast between readings ▪ Deconstruction of language or logic ▪ Identification of methodological shortcomings 	/6	
Writing & Communication Proficiency	<ul style="list-style-type: none"> -Organize writing with clear structure: <ul style="list-style-type: none"> ▪ Introduction ▪ Body ▪ Conclusion -Avoid spelling, grammar, syntax, punctuation, or other writing errors 	/4	

Rubric for Evaluation: Leading Class Discussions

(adapted from rubric published by Stevens & Levi 2004, <http://www.humber.ca/centreforteachingandlearning/>)

Task: Identify key themes for discussion from the two assigned weekly readings. One week before leading your class discussion, select and distribute one additional reading that supplements the two assigned readings. Conduct a 30-minute discussion with the class and use the rubric to assist you in planning and leading the discussion.

Evaluation Category	Standards for Excellent Work	Points	Instructor Comments
Preparation	<ul style="list-style-type: none"> -Additional reading given out a week before discussion -Focus questions given at least 3 full days prior to discussion 	/3	
Content	<ul style="list-style-type: none"> -Themes of readings summarized clearly via email and at beginning of discussion -Additional reading relevant & appropriate for weekly topic 	/4	

<p>Discussion & Debate Methods</p>	<ul style="list-style-type: none"> -Engage students & promote participation -Make sure everyone contributes and no one dominates -Maintain professional & constructively positive tone to discussion -Promote alternative viewpoints to diversify & broaden discussion -Highlight key points of debate & why they are important -Use different discussion formats such as with pairs or small groups -Promote debate on theoretical & methodological strengths & weaknesses -Promote rigorous critique of ideas & methods, not of people -Encourage synthesis of themes across readings as part of discussion summary 	<p>/5</p>	
<p>Discussion Guiding Questions</p>	<ul style="list-style-type: none"> -Be challenging & thought provoking -Use understandable language -Use references to specific passages from the readings -Ask questions that take discussion in fruitful new directions -Use questions to identify frontiers of current knowledge 	<p>/5</p>	
<p>Facilitation Skills</p>	<ul style="list-style-type: none"> -Respectful attention & eye contact -Active listening -Asking respectfully for clarification -Paraphrasing to aid understanding -Redirecting questions to various students -Tactfully steer discussion to remain on topic, if needed -Summarizing themes to conclude 	<p>/3</p>	
<p>Total Score</p>		<p>/20</p>	

Assignments: There will be 13 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. 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 weekly 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%
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 28 th 2018
No Class, Labor Day*	Mon, Sep 3 rd 2018
Midterm Exam	Mon, Oct 15th 2018
No Class, Fall Break, Homecoming	Fri, Nov 2 nd 2018
No Class, Veterans Day*	Mon, Nov 12 th 2018
No Class, Thanksgiving Break	Wed-Fri, Nov 21-23 rd 2018
Final Project Presentations	Mon, Dec 3rd 2018
Final Project Due	Wed, Dec 5th 2018
Reading Days	Thurs-Fri, Dec 6-7 th 2018
Final Exam	Tues, Dec 11th 2018
Fall 2018 Grades Visible on https://one.uf.edu/dashboard/	Wed, Dec 19 th 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; Assignment #1	None
Week 2	M	Physical Hazard Risk Mapping; Assignment #2; Assignment #1 due	Elsner et al. 2012; Deng et al. 2016
Week 3	M	Multi-Hazard Risk Mapping; Assignment #3; Assignment #2 due	Tate et al. 2011; Kappes et al. 2012

Week 4	M	Geospatial Analysis of Damage & Casualties; Assignment #4; Assignment #3 due	Borden & Cutter 2008; Hahn et al. 2017
Week 5	M	Demographic Geospatial Data & Visualizing Uncertainty; Assignment #5; Assignment #4 due	Wong & Sun 2013; Folch et al. 2016
Week 6	M	GIS-Based Social Vulnerability Analysis I; Assignment #6; Assignment #5 due	Morrow 1999; Flanagan et al. 2011
Week 7	M	GIS-Based Social Vulnerability Analysis II; Assignment #7; Assignment #6 due	Cutter et al. 2003; Cutter & Finch 2008
Week 8	M	Midterm Exam; Assignment #7 due	
Week 9	M	Dasymetric Mapping & Social Vulnerability Analysis; Assignment #8	Nelson et al. 2015; Garcia et al. 2016
Week 10	M	Clustering Methods & Social Vulnerability Analysis; Assignment #9; Assignment #8 due	Rufat 2013; Wood et al. 2015
Week 11	M	Risk/Vulnerability Integrated Analysis; Assignment #10; Assignment #9 due	Karagiorgos et al. 2016; Guillard-Goncalves & Zezere 2018
Week 12	M	Vulnerability Analysis Using Participatory & Qualitative GIS Methods; Assignment #11; Assignment #10 due	Cadag & Gaillard 2012; Hazarika et al. 2016
Week 13	M	GIS-Based Disaster Resilience Index I; Assignment #12; Assignment #11 due	Cutter et al. 2010; Burton 2015
Week 14	M	GIS-Based Disaster Resilience Index II; Assignment #13; Assignment #12 due	Frazier et al. 2014; Bakkensen et al. 2017
Week 15	M	Students Work on Projects; Assignment #13 due	None
Week 16	M	Final Project Presentations and Final Project Papers Due	
Exam Week	?	Final Exam Date/Time TBA	

IX. Course Policies: Attendance, Make-Ups, and Grades

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.

X. Course Policies: Technology and Media

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. The instructor will reasonably expect similar time frames for responses to emails sent to students.

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.

XI. Course Policies: Student Expectations

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>.

XII. Campus Resources for Students:

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 Services (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/>

XIII. Assigned Readings Citations:

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.

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.

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.

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.

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.

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.

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.

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

- 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.
- 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.
- 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.
- 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.
- 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.
- 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. Schmidlein, 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>.

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

Department	Name and Title
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Phone Number	E-mail
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Comments	

Department	Name and Title
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