University of Florida
FAS 4932 (4 credits)
Spatial Sciences for Marine Environmental Characterization
Fall 2019 Syllabus
Delivery Format: On-Campus
Lab day: Wednesday, 3:00PM-4:55PM (McCarthy B 3086)
Lecture day: Thursday, 8:30AM-11:30AM (McCarthy B 3108)
https://ufl.instructure.com/courses/

Instructor: Vincent Lecours, Ph.D.
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Office Hours: By appointment
Preferred Course Communications: email

Prerequisites
There are no prerequisites for this course.

PURPOSE AND OUTCOME

Course Overview
An introduction to the geospatial technologies, concepts and methods required to acquire, analyze and manage geographic data used in a context of marine habitat mapping. The fields of cartography, remote sensing, and geographic information systems (GIS) will be reviewed, and students will be introduced to quantitative methods relevant to the study of marine geomorphology and biology and how they combine to provide a spatial representation of marine habitats. Emphasis is given to the understanding and appreciation of maps as a mean of communication between stakeholders with different backgrounds and expertise.

Relation to Program Outcomes
This course provides an interdisciplinary perspective on the study of marine environments. It involves concepts from biology, ecology, geomorphology, oceanography and the spatial sciences. It is meant to bridge the Geomatics Program with the Fisheries and Aquatic Sciences Program by complementing existing courses in those programs (*e.g.*, SUR4934 – Marine Geomatics, FAS6932 – Spatial Ecology and Modeling). The course is aimed at upper-level undergraduate students from both programs, at students from the Department of Wildlife Ecology and Conservation, and any others with an interest in using the spatial sciences to map and study the marine environment.

Overall Course Goals
In this course, students will…
1. *Learn* about marine habitats and what defines them
2. *Improve* their spatial awareness and geographic literacy
3. *Improve* their digital literacy and fluency
4. *Cultivate* critical thinking
5. *Develop* cooperative attitude
6. *Develop* oral and written communication skills

Upon successful completion of the course, students will be able to (see page 7 for a full list of student learning objectives):

-*Describe* data collection techniques relevant to marine habitat mapping
-*Explain* the different components of marine habitats and how they can be quantified and situated in a geographic context
-*Prepare* different types of spatial data for their inclusion in a habitat mapping workflow
-*Produce* habitat maps in different contexts

Instructional Methods

Course concepts will be introduced using real examples to demonstrate how spatial sciences can assist in answering marine sciences questions. This course has a lab and field-based components in which students will learn how to collect spatial data and to perform GIS-based marine environmental characterization. The in-class time will be focused on discussions and building skillsets like spatial critical thinking and science communication. A series of assignments and in-class tasks will provide students with the opportunity to use spatial data and maps for both interpretation and analysis.

DESCRIPTION OF COURSE CONTENT

Topical Outline/Course Schedule (subject to change)

Weeks	Dates	Topics	Readings (subject to change)	Assignments
1	**08/21** (Lab)	Course Introduction, Introduction to Spatial Sciences		
	08/22	Introduction to Marine Habitat Mapping, Spatial Data Characteristics, Geodatabases	Costa *et al.* (2009) OR Knudby *et al.* (2010)	
2	**08/28** (Lab)	Introduction to GIS		
	08/29	Remote Sensing	TBD	Summary #1
3	**09/04** (Lab)			Quiz #1
	09/05	Cartography	Brown *et al.* (2011) OR McArthur *et al.* (2010)	
4	**09/11** (Lab)			Quiz #2
	09/12	Surrogacy, Habitat Mapping Approaches	Bouchet et al. (2015) OR Wilson et al. (2007)	Summary #2
5	**09/18** (Lab)			Lab #1, Quiz #3
	09/19	Fitness-for-use, Geomorphometry		Summary #3
6	**09/25** (Lab)			Lab #2, Quiz #4
	09/26	Classifiers, Species Distribution Models, Spatial Analysis of Marine Environments		
7	**10/02** (Lab)			Lab #3, Quiz #5
	10/03	Visit of the Map Library and Field Trip		
8	**10/09** (Lab)	Project Planning		Lab #4
	10/10	Peer-Review, Science Communication, Proposal Preparation		
9	**10/16** (Lab)	Proposal Preparation		
	10/17	Proposal Presentation		Speed Talk

Weeks	Dates	Topics	Readings (subject to change)	Assignments
10	**10/23** (Lab)	Team Work		
	10/24	Communicating with Maps, Stakeholders Involvement	Greene *et al.* (2005) OR Lecours (2017)	
11	**10/30** (Lab)	Team Work		
	10/31			
12	**11/06** (Lab)			Report Part #1
	11/07			
13	**11/13** (Lab)			
	11/14			Report Part #2
14	**11/20** (Lab)			
	11/21			
15	**12/04** (Lab)	Project Presentation		Final Presentation, Final Report

Course Materials and Technology

Recommended readings: "How to lie with maps, 3rd edition", by Mark Monmonier. 256 p.

The course will use a variety of GIS software, including open-source software that can be downloaded on any desktop computer and laptop, and the commercial ESRI ArcGIS Desktop software. ArcGIS is available by getting a license from the UF GeoPlan Center (https://www.geoplan.ufl.edu/licensed_software.shtml), in the UF computer labs (https://labs.at.ufl.edu/; note that the labs may be reserved for classes), or remotely from the UFApps (https://info.apps.ufl.edu/).

Technical support is available through the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- https://lss.at.ufl.edu/help.shtml

ACADEMIC REQUIREMENTS AND GRADING

Assignments and Exams

- Readings will be provided throughout the semester. Students are expected to write a short summary of their assigned readings in preparation for class discussion. Three opportunities will be provided to write such summary; students must submit at least two summaries over the course of the semester. If a student submits more than two summaries, those with the highest grades will be counted as part of the final grade.
- In lieu of comprehensive mid-term and final exams, five quizzes will be given to assess the students' understanding of remote sensing, cartographic and GIS concepts, in addition to their ability to describe data collection and analytical techniques relevant to marine habitat mapping and explain the different components of marine habitats and how they can be quantified and situated in a geographic context. The four highest grades of the five quizzes will be counted as part of the final grade.
- This course has a lab component during which the students will apply theoretical concepts in a practical, GIS environment using real data. Four of the lab assignments will be graded, and the three highest grades of those assignments will count towards the final grade.
- A team project will be assigned in the second half of the semester. Students will be asked to propose a habitat mapping project of their choice, which has to include the production of habitat maps using different approaches seen in class, in addition to at least one spatial analysis. The proposals will be peer-reviewed (double-blind) and students will select two or three projects among those proposed to

be completed in multidisciplinary teams. The maps that will be produced will be used to assess their ability to prepare different types of spatial data for their inclusion in a habitat mapping workflow. The evaluation of the project will be based on an oral (two presentations, 25% of the overall grade) and a written component (one report, 30% of the overall grade). The final report will be submitted in sections, on which students will receive feedback and have the opportunity to get back partial grades if the feedback is integrated into the final version of the report.

- All assignments will be submitted on the course website. Presentation of the assignments must be neat, logical, organized and appropriately referenced. Poor presentation will be penalized up to a maximum of 20% of the value of assignments and exams.

Grading

Requirement	**% of final grade**
Reading Summaries (2 best of 3)	5% each (10%)
Quizzes (4 best of 5)	5% each (20%)
Labs (3 best of 4)	5% each (15%)
Lightning Talk (Individual)	10%
Final Report (Team)	30%
Final Presentation (Team)	15%

Points earned	**93-100**	**90-92**	**87-89**	**83-86**	**80-82**	**77-79**	**73-76**	**70-72**	**67-69**	**63-66**	**60-62**	**Below 60**
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

Letter Grade	**A**	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**D-**	**E**	**WF**	**I**	**NG**	**S-U**
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0	0.0	0.0	0.0	0.0

For greater detail on the meaning of letter grades and university policies related to them, see the Registrar's Grade Policy regulations at: http://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Late Policy

Due dates are indicated in the calendar above. Any modifications to these dates will be announced by the instructor when assignments are given. A deduction of 10% will be made for each day that an assignment is late, with the first 10% being removed immediately after the due time.

Policy Related to Make-up Exams, Other Work, and Required Class Attendance

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies. Please note all faculty are bound by the UF policy for excused absences. For information regarding the UF Attendance Policy see the Registrar website for additional details: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

STUDENT EXPECTATIONS, ROLES, AND OPPORTUNITIES FOR INPUT

Expectations Regarding Course Behavior

You are expected to actively engage in the course throughout the semester. You must come to class prepared by completing all out-of-class assignments. This preparation gives you the knowledge or practice needed to engage in higher levels of learning during the live class sessions. If you are not prepared for the face-to-face sessions, you may struggle to keep pace with the activities occurring in the live sessions, and it is unlikely that you will reach the higher learning goals of the course. Similarly, you are expected to actively participate in the live class. Your participation fosters a rich course experience for you and your peers that facilitates overall mastery of the course objectives.

In order to facilitate the creation of a functional learning community and out of respect for the instructor and the other students, it is expected that all cell phones and laptops be either set on silent mode or turned off, except when authorized by the instructor. Recording devices are strictly prohibited.

Opportunities for Input and Online Faculty Course Evaluation Process

Your comments are very valuable to the instructor. They will be used by the instructor to make specific improvements to the course (e.g., assignments) and teaching style. The instructor will be providing opportunities throughout the semester for students to provide direct feedback on the course. However, students are encouraged to email the instructor at any time if they have concerns or comments to share with the instructor.

Students are also expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. 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 honesty 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 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 additional information regarding Academic Integrity, please see Student Conduct and Honor Code:

https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Students Complaints
UF's complaints policy can be found at: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

SUPPORT SERVICES

Accommodations for Students with Disabilities
If you require classroom accommodation because of a disability, you must register with the Dean of Students Office http://www.dso.ufl.edu within the first week of class. The Dean of Students Office will provide documentation of accommodations to you, which you must then give to the instructor of the course to receive accommodations. Please make sure you provide this letter to the instructor by the end of the second week of the course. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health
Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The Counseling and Wellness Center (352-392-1575) offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: http://www.counseling.ufl.edu. Online and in person assistance is available.
- You Matter We Care website: http://www.umatter.ufl.edu/. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.
- The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the website at: https://shcc.ufl.edu/
- Crisis intervention is always available 24/7 from the Alachua County Crisis Center (352-264-6789) http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx

Do not wait until you reach a crisis to come in and talk with us. You are not alone so do not be afraid to ask for assistance.

Inclusive Learning Environment
This course embraces the University of Florida's Non-Discrimination Policy, which reads, "The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act." If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see the instructor or refer to the Office of Multicultural & Diversity Affairs website: www.multicultural.ufl.edu

READING LIST

Brown, C.J., Smith, S.J., Lawton, P., and J.T. Anderson (2011) Benthic habitat mapping: a review of progress towards improved understanding of the spatial ecology of the seafloor using acoustic techniques. *Estuarine, Coastal and Shelf Science*, 92, 502-520.

Costa, B.M., Battista, T.A., and S.J. Pittman (2009) Comparative evaluation of airborne LiDAR and ship-based multibeam SoNAR bathymetry and intensity for mapping coral reef ecosystem. *Remote Sensing of Environment*, 113, 1082-1100.

Greene, G.H., Bizarro, J.J., Tilden, J.E., Lopez, H.L., and M.D. Erdey (2005) The benefits and pitfalls of geographic information systems in marine benthic habitat mapping. *In*: Wright, D.J. and A.J. Scholz (eds.) *Place matters: Geospatial tools for marine science, conservation, and management in the Pacific northwest*, pp. 34–46. Corvallis: Oregon State University Press.

Knudby, A., LeDrew, E., and A. Brenning (2010) Predictive mapping of reef fish species richness, diversity and biomass in Zanzibar using IKONOS imagery and machine-learning techniques. *Remote Sensing of Environment*, 114(6), 1230-1241.

Lecours, V. (2017) On the use of maps and models in habitat mapping and species distribution models. *Frontiers in Marine Science*, 4(288), 1-18.

McArthur, M.A., Brooke, B.P., Przeslawski, R., Ryan, D.A., Lucieer, V.L., Nichol, S., McCallum, A.W., Mellin, C., Cresswell, I.D., and L.C. Radke (2010) On the use of abiotic surrogates to describe marine benthic biodiversity. *Estuarine, Coastal and Shelf Science*, 88, 21-32.

Student Learning Outcomes

Classes	Student Learning Objectives	Course Goals					
		1	2	3	4	5	6
Lab 1	Describe spatial sciences		☒				
	Explain how maps can be used to communicate		☒				
	Compare different mapping outcomes		☒				
	Identify sources of differences in mapping outcomes		☒				
Lecture 1	Define habitats and marine habitat mapping	☒					
	Explain the different components of marine habitats	☒					
	Recognize different types of spatial data		☒				
Lab 2	Memorize the different components of a GIS			☒			
	Manipulate spatial data in GIS		☒	☒			
Lecture 2	Summarize a piece of the scientific literature	☒	☒		☒		☒
	Define remote sensing		☒				
	Contrast optical and acoustic remote sensing		☒				
	Define wavelength, frequency, and wave velocity		☒				
	Explain the electromagnetic spectrum and its relevance to habitat mapping	☒	☒				
	Contrast different types of sensors and platforms		☒				
	Describe data collection techniques relevant to marine habitat mapping	☒	☒				
Lab 3	Locate satellite imagery and bathymetric data		☒	☒			
	Manipulate satellite imagery and bathymetric data		☒	☒			
Lecture 3	Summarize a piece of the scientific literature	☒	☒		☒		☒
	Recognize different types of maps		☒				
	Memorize different cartographic concepts, norms, and conventions		☒				
	Explain geographic reference systems and map projections		☒				
Lab 4	Prepare different types of spatial data for their inclusion in a habitat mapping workflow	☒	☒	☒			
	Design different types of maps		☒	☒			
Lecture 4	Summarize a piece of the scientific literature	☒	☒		☒		☒
	Define surrogacy	☒					

	Recognize potential surrogates of species/habitat distributions	☒					
	Contrast the different approaches to habitat mapping	☒					
Lab 5	Locate different types of data for habitat mapping	☒	☒	☒			
	Apply unsupervised and supervised approaches to habitat mapping	☒	☒	☒			
Lecture 5	Summarize a piece of the scientific literature	☒	☒		☒		☒
	Describe issues of data quality relevant to habitat mapping	☒	☒				
	Describe the concept of fitness-for-use	☒	☒		☒		
	Explain what is geomorphometry and its relevance for marine habitat mapping	☒	☒				
Lab 6	Locate bathymetric data			☒			
	Manipulate bathymetric data to derive a suite of terrain attributes		☒	☒			
	Apply an unsupervised approach to habitat characterization		☒	☒			
	Design a multi-paneled map		☒	☒			
Lecture 6	Summarize a piece of the scientific literature	☒	☒		☒		☒
	Remember different unsupervised and supervised approaches to habitat mapping		☒		☒	☒	☒
	Contrast different types of additional spatial analyses that can be performed from habitat maps (*e.g.*, seascape analyses, hotspot analyses, connectivity analyses)	☒	☒				
Lab 7	Evaluate different types of additional spatial analyses that can be performed from habitat maps	☒	☒	☒	☒		
Lecture 7							
Lab 8	Locate existing spatial data and their associated metadata	☒	☒	☒			
	Evaluate, critically, spatial data for a given context	☒	☒		☒		
Lecture 8	Design a suitable habitat mapping project for a given purpose	☒	☒		☒		☒
Lab 9	Design a suitable habitat mapping project for a given purpose	☒	☒		☒		☒
	Design a locational map with environmental data		☒	☒			
	Defend a project idea orally and efficiently (speed talk)						☒
Labs 10-14	Cooperate to complete a habitat mapping project	☒	☒	☒		☒	
	Design habitat maps	☒	☒	☒		☒	
	Assemble a scientific article	☒	☒	☒		☒	☒
Lectures 10-14	Cooperate to complete a habitat mapping project	☒	☒	☒		☒	
	Design habitat maps	☒	☒	☒		☒	
	Assemble a scientific article	☒	☒	☒		☒	☒
Lab 15	Defend a habitat mapping project orally						☒
	Defend a habitat mapping project on paper						☒