GIS Practicum Syllabus

Fall 2010

Updated: August 29, 2010

Course Information

Title :	GIS Practicum
Designator:	NR243
CRN:	92961
Description:	The GIS Practicum is an applied course in geospatial technology. The core subject areas of the course are: spatial database development and management, metadata, editing, automated geoprocessing, advanced analytical techniques, and the geoweb. The course is designed for upper-level undergraduate and graduate students who are presently working on a thesis or project with a GIS focus and/or who envision using GIS in their professional careers. The course expands upon the knowledge students' gained in previous geospatial technology courses, serves to hone their GIS skills, and advance their understanding of geospatial technology.
Format:	Each week the structure will be as follows: (1) Review the homework assignment that is due (2) Weekly topic(s) (3) Review the homework assignment for next week (4) Homework/project help
Credits:	3
Location:	Hills 228
Meeting days:	Monday, Wednesday, and Friday
Meeting time:	8:30AM – 9:20AM
First day of class:	August 30, 2010
Last day of class:	December 8, 2010
No class days:	September 6 (Monday) October 11 (Monday) October 13 (Wednesday) October 27 (Wednesday) November 22 (Monday) November 24 (Wednesday) November 26 (Friday)
Prerequisite(s):	Introductory GIS course such as NR143, GEOG184, or equivalent. Instructor permission is required to register.

Instructor

Name:	Jarlath O'Neil-Dunne
Email:	joneildu@uvm.edu
Office location:	George D. Aiken Forest Sciences Lab, 705 Spear Street, Room 106
Office hours:	Open.
Phone:	802.656.3324
Biography:	Jarlath O'Neil-Dunne is a geospatial analyst with the University of Vermont's (UVM) Spatial Analysis Laboratory and is the lead geospatial analyst for USDA Forest Service's Northern Research Station People and the Environment Division. Over the years his research has focused on the application of geospatial technology to a broad range of natural resource related issues such as environmental justice, wildlife habitat mapping, high-elevation forest decline, land cover change detection, community health, and water quality modeling. Most recently his work has centered on urban ecosystem assessment where the results of his analysis have been used by communities throughout North America to establish urban tree canopy goals. In addition to his research duties Jarlath teaches two courses at UVM that focus on the application of geospatial technology. He

	earned a Bachelor of Science in Forestry from the University of New Hampshire, a Master's of Science in Water Resources from the University of Vermont, and certificates in hyperspectral image exploitation and joint GIS operations from the National Geospatial Intelligence College. For over a decade he served as an officer in the United States Marine Corps (active & reserve) with tours in East Africa, the Middle East, and East Asia. During the early stages of Operation Iraqi Freedom he co-directed the Marine Corps' imagery intelligence assets. He is a recipient of the Vermont Spatial Data Partnership Outstanding Achievement Award, the New York State GIS Partnership Award, and the eCognition Black Belt.
Policies	
Conduct:	Students are expected to adhere to the UVM Code of Student Rights and Responsibilities. Students will also be expected to show common courtesy. If you need to check Facebook, email, etc., please do so outside of class.
Assignments:	1) Assisting other students with homework assignments is not permitted. 2) For the project, students may provide help to each other in the form of advice (e.g. don't process someone else's data). 3) Late assignments will not be accepted. The due date for each homework assignment is listed on Blackboard. 4) Students are expected to make full use of the resources (e.g. ESRI Resource Center) available to them prior to asking questions. 5) Questions regarding homework assignments should be posted to the course's Blackboard discussion forum. **Only email the instructor if your question is not suitable for Blackboard**.
Grading system:	Grades are awarded based on the percentage of points earned in the homework assignments and final project. Homework - 60 points (10 assignments, 6 points each) Project - 40 points (1st milestone = 2.5 points, 2nd milestone = 2.5 points, final submission = 35 points)
Letter grades:	100% - 99% = A+ 98% - 93% = A 92% - 90% = A- 89% - 88% = B+ 87% - 83% = B 82% - 80% = B- 79% - 78% = C+ 77% - 73% = C 72% - 70% = C- 69% - 68% = D+ 67% - 63% = D 62% - 60% = D- <60% = F
Final Exam	
About:	Final exam attendance is mandatory. There is no final exam per se. During the final exam period students will turn in their projects. Graduate students will be required to present their projects during the final exam period.
Day:	Friday, December 17, 2010
Time:	10:30 AM – 1:15 PM
Location:	Hills 228
Materials	
Text:	There is no formal text for this course.
On-line resources:	GIS @ UVM

	ArcGIS Desktop Help ArcGIS Resource Centers ESRI Support Center ESRI TV Vermont GIS Listserv ERDAS Support Site KML Reference Google Earth Outreach Maps & GIS Resources by State Planet Geospatial
Software used:	ArcGIS 9.3.1 Google Earth 5.0 ERDAS IMAGINE 2010.1 QT Modeler 7.1.1 *Note: it may not be possible to complete all homework assignments using previous versions of the software listed above. Please confirm the computer lab you are using is running the version required for this course*
Recommended purchases:	Students are highly encouraged to purchase a portable external hard drive (>100GB in size) for use in this course. This will assist in overcoming some of the network issues associated with large geospatial datasets. External hard drives are known to be unreliable so please insure to back up any data stored on an external drive on a regular basis.

Projects

Requirement:	Undergraduate students in the course are required to complete a service learning project or a project related to ongoing research they are involved in. Graduate students may elect to complete a service learning project or a project related to their thesis. All projects must be approved by the instructor.
Grading:	The project is worth a total of 40 points, 5 of which are split between the first two milestones. Projects will be graded based on a criteria composed of difficulty and quality. Thus, it will be possible to receive a low grade if a difficult project is of poor quality and high grade if the project is not extremely difficult, but is of very high quality. The highest marks will be awarded to those projects that demonstrate quality work and that had a high degree of difficulty. Graduate students will be required to present their project work and will do so on the day of the final exam.
Milestones:	The milestones serve to help you, the student, focus your project. The first milestone is the project proposal. The project proposal should, at a minimum, state the purpose of the project, the desired end state including any deliverables, and contain a detailed methods section that outlines the steps you will perform to achieve the end state. The methods section is the most important part of the proposal, it should serve to help you focus how to apply the knowledge learned in the course to the project in addition to identifying any gaps in that knowledge. The second milestone serves as an opportunity to reflect on the project to date. At this point in time it is required that you have all data for project assembled and pre-processed. You are required to hand in a one page paper that addresses four issues: 1) how the desired outcome of the project has changed based on your discussion with the client, 2) gaps in your knowledge base as it relates to meeting the client's needs, 3) challenges in obtaining data, and 4) final deliverables that you will submit to the client. Upon the instructor's review of this milestone you are required to contact the client and inform him/her of the final deliverables.
Tips for success:	1) Ask questions, lots of questions. 2) Have the instructor review your project prior to the due date. 3) Plan on your project taking you 3-4 times the amount of time you thought it would.

	4) Save your data early, save often, save multiple versions, and save it in multiple locations. 5) Do not leave it until the last minute. 6) Consult with your external project partner on a regular basis (if applicable).
Lesson Plan	
Week 1	
Lesson:	Course overview, GIS @ UVM, and projection issues.
Week of:	8/29
Objectives:	Overview of the course, GIS resources at UVM, and dealing with coordinate system issues.
Topics:	1) Course overview 2) Lab overview 3) Blackboard 4) Guidelines for submitting assignments 5) Data sources 6) Data formats 7) Unknown coordinate systems
Assignment(s):	Homework #1 – Dealing with an unknown coordinate system
Week 2	
Lesson:	Geodatabases
Week of:	9/5
Objectives:	Students will be able to successfully design a geodatabase; making use of feature datasets, domains, feature classes, and topology.
Topics:	1) Creating geodatabases 2) Feature datasets 3) Domains 4) Feature classes 5) Topology 6) XML workspaces
Assignment(s):	Homework #2 - Geodatabase design
Week 3	
Lesson:	Editing
Week of:	9/12
Objectives:	Students will be able to edit point, line, and polygon features within a geodatabase, and correct topology errors.
Topics:	1) Editing features 2) Editing topology
Assignment(s):	Homework #3 - Editing
Week 4	
Lesson:	Metadata
Week of:	9/19
Objectives:	Students should be able to interpret, import, export, and create metadata.
Topics:	1) FGDC metadata 2) Metadata formats 3) Editing 4) Importing/Exporting 5) Templates
Assignment(s):	Homework # 4 - Metadata
Week 5	
Lesson:	Raster Data Structure and Processing

Week of:	9/26
Objectives:	Students will understand how raster data is structured, the advantages/disadvantages of various formats, and how to manipulate raster data.
Topics:	1) Raster formats 2) Raster overlays 3) Neighborhood and zonal functions 4) Clipping raster data
Assignment(s):	Homework #5 – Raster processing
Week 6	
Lesson:	Raster Data Management & Terrain Analysis
Week of:	10/3
Objectives:	Students will be familiar with the process of using geodatabases to manage raster datasets. Students will understand the process of importing and analyzing high resolution terrain data.
Topics:	1) Geodatabase management of raster datasets 2) LiDAR 3) High resolution terrain analysis
Assignment(s):	None
Week 7	
Lesson:	Image interpretation and preprocessing
Week of:	10/10
Objectives:	Students will understand the formats used to store imagery and how to apply preprocessing techniques in ERDAS IMAGINE to prepare imagery for GIS-based analysis.
Topics:	1) Interpreting imagery 3) Image enhancement 4) Clipping 5) Mosaicking 6) Assisted digitizing
Assignment(s):	Homework #6 - Imagery data prep
Week 8	
Lesson:	Raster processing - hydrologic modeling
Week of:	10/17
Objectives:	Students will be able to employ hydrologic modeling techniques to delineate watersheds.
Topics:	1) Hydrologic modeling theory 2) DEM preparation 3) Flow accumulation & flow direction 4) Watershed delineation
Assignment(s):	Homework #7 - Watershed delineation
Week 9	
Lesson:	Automating geoprocessing tasks, part 1
Week of:	10/24
Objectives:	Students will be able to link geoprocessing tasks in the Model Builder environment.
Topics:	1) Geoprocessing settings 2) Toolboxes, toolsets, models, & scripts 3) Building a model
Assignment(s):	Project milestone #1 - proposal
Week 10	
Lesson:	Automating geoprocessing tasks, part 2
Week of:	10/31

Objectives	Students will be able to build fully functional, user-friendly models in ArcGIS.
Topics:	1) Model Builder tips and tricks 2) Trouble shooting 3) Creating documentation 4) Distributing models
Assignment(s):	Homework #8 - Model Builder
Week 11	
Lesson:	Advanced field calculations and labeling using VBA and VBScript
Week of:	11/7
Objectives	Students will understand the basic syntax of Visual Basic for Applications (VBA) and Visual Basic Script (VBScript) and how to use these languages in field calculations and labeling respectively.
Topics:	1) Using VBA in field calculations. 2) Advanced labeling with VBScript.
Assignment(s):	Homework #9 - VBA
Week 12	
Lesson:	Sharing data
Week of:	11/14
Objectives:	Students will learn how to share data using non-web based approaches. Project reviews will also take place this week.
Topics:	1) "Packaging" data and maps for distribution 2) Geo-enabled PDFs 3) ArcReader 4) Project reviews
Homework:	Project Milestone #2
Week 13	
Lesson:	The Geoweb - Web Services
Week of:	11/28
Objectives:	Students will learn how to access data and serve up data using web services and KML.
Topics:	1) The GeoWeb, an overview 2) GeoWeb formats – ArcIMS, WMS, WFS, WCS, GeoRSS, KML 3) KML structure 4) ArcGIS to KML 5) Sharing KML on the WWW
Assignment(s):	Homework #10 – Create a web map
Week 14	
Lesson:	Linear Referencing
Week of:	12/5
Objectives :	Students will learn how to employ linear referencing to store geographic locations by using relative positions along measured linear features.
Topics:	1) Uses 2) Route features 3) Querying 4) Editing 5) Event data
Assignment(s):	None
Final Exam	
Lesson:	Final Exam
Day:	Friday, December 18, 2009
Time:	11:45AM – 2:45PM

About:	There is no final exam per se, but final exam attendance is mandatory. Projects are due at the start of the final exam. All deliverables must have been transferred to the client at this point in time. Graduate students will be required to present their projects during the final exam period. The final exam period also serves as time to discuss, as a group, some of the challenges faced in completing the project, both in terms technical issues and client/contractor issues.