GIS (Geographic Information Systems) and Spatial Modeling

Class: Tuesday, Thursday 1-4pm, Miller 22

Instructor: Dr. Amy Faivre   Offices: SC 119/119A
Phone: x3580   Office Hours:
Email: aefaivre@cedarcrest.edu   Thursdays 4-5pm,
                                                         or by appointment

Prerequisites: BIO 121 and 122; BIO 234 Ecology is recommended.

Required Texts:
Longley, P.A., M.F. Goodchild, D.J. Maguire, D.W. Rhind. 2005. Geographic
Information Systems and Science. 2nd Edition. John Wiley and Sons, Ltd.: New Jersey.

Price, M. 2008. Mastering ArcGIS. 3rd Edition. McGraw-Hill, New York.

Other Materials: A memory stick/travel drive (highly recommended); a 3-ringed binder
will be needed to store hand-outs and notes. I will provide you with additional reading
materials and assignments throughout the semester.

Course Description:
Students in this course will gain both field and lab experience in the uses of GPS
(Geographical Positioning Systems) units and GIS (Geographic Information System)
software (*ArcGIS* 9.2 and possibly *Arcview* 3.3). The relationship of these new
technologies to the fields of conservation biology, land management, business, criminal
investigation, and city planning will be discussed through readings in the primary
literature and experienced through class projects. Projects include mapping and data
basing the Cedar Crest College Buildings and Arboretum, assessing habitat use by
animals in a local park, and an independent project. Students must take both the lecture
and lab portions of this course.

Course Objectives and Outcomes:
    The use of GIS mapping capabilities and GPS (Global Positioning System) data
collection has revolutionized everything from our cars (many of which have small GPS
units installed that can give us directions instantaneously from anywhere within North
America) to the management of natural habitats. This technology allows us to overlay a
number of data layers (e.g., soil types, stream localities, property boundaries, vegetation,
and bird distributions) onto a single map. From these multi-layered maps students can
assess anything from the best area for building future nature preserves to how the

building of a shopping mall could impact flooding in local streams due to parking lot run-off. Students who are interested in pursuing careers in conservation biology, land management, city planning or continuing on to graduate school in the fields of ecology and conservation biology should become familiar with these new technologies. Premier journals in the field of Biodiversity and Conservation Biology, including *Conservation Biology* and *Ecology*, include research articles in nearly every issue involving questions answered using this technology.

Through reading and summarizing examples in the primary literature where GIS is used, students will gain information literacy as well as learn how to assess critically this tool and the research done with it. Technological competency and quantitative reasoning will be addressed in lab exercises and course projects. Students will have an opportunity to demonstrate their ability to communicate orally in the classroom discussions and in presentations of their projects.   With these experiences, by the end of the course, students will achieve the following outcomes assessed in the following manner:

Outcome (1.) Gain an understanding of and critically assess basic principles in geography and cartography as they relate to the use of GIS and analysis of spatial data.
Assessment of Outcome (1.) Exams from course lecture and laboratory material will assess students' comprehension of the principles of GIS, geography, and cartography.

Outcome (2.) Become technologically competent in the use of *ArcGIS* 9.2 and possibly *Arcview* 3.3, GIS software programs, by using quantitative and qualitative reasoning to map collected data, analyze these and other data, and draw conclusions about habitat values and land use.
Assessment of Outcome (2.) Exercises from the laboratory textbook, class projects, and an independent project will indicate the extent to which students have mastered the use of these important software programs.

Outcome (3.) Become technologically competent in the use of GPS units in navigating, collecting data and mapping data. Understand how the units navigate using satellite reception.
Assessment of Outcome (3.) Class projects will involve the use of GPS units in the field. Students will also design an independent project to gather data using GPS.

Outcome (4.) Participate in and critically assess the use of GPS/GIS in conservation biology, ecology, land management and city planning.
Assessment of Outcome (4.) Class and independent projects are structured to provide students with hands-on experience in collecting and mapping their own conservation-related or landscape level data. Each student will present and critique a paper from the primary literature that involves the use of GIS and/or GPS.

Student Assessment (Assignments and Grading): More detailed information regarding each of these assignments will be handed out in class.

4 Credit Course   **Total Course Points: 440**

Due Date	Assignment	Points
2/17	Exam 1	50
3/17, 3/19 4/7, 4/9, 4/14	Paper Presentations	50
3/26	Exam 2	50
3/31 by 1pm	CCC Arboretum Project	50
4/9	Outline of Independent Project Due	15
4/21 by 1pm	Trexler Park Habitat and Wildlife Assessment Project	75
4/28	Exam 3	50
Finals Week	Presentation of Independent Project and Report	50+50

Final Course Grade: Final grades will be calculated as follows:

93.0-100% A		90.0-92.9% A-	87.0-89.9% B+	83.0-86.9% B	80.0-82.9% B-
77.0-79.9% C+	73.0-76.9% C	70.0-72.9% C-	67.0-69.9% D+	60.0-66.9% D	<60.0% F

Lecture – Our course meets twice a week for three hours each day. Most days I will lecture for the first hour or so of class and the remaining two hours will be spent on the laboratory portion of the course. We will be discussing many important and complex theories and terms in lecture. Participation and questions are **strongly encouraged**. There will not be a formal grade for participation, however students actively engaged in asking questions and contributing to classroom dialogue will have their final grade rounded up if their grade is near or at the upper range of a grade (e.g., 89/B+ will be changed to an A-). Students not participating in lecture discussions will not have their grades rounded up. We will miss the benefits of having those students' contributions and ideas shared in class.

Date*	Topic	Reading to be done after class **
1/20	Introduction to GIS	Chap. 1
1/22	History and Applications of GIS	Chap. 1 and 2
1/27	Representing Geography	Chap. 3
1/29	Representing Geography	Chap. 3
2/3	The Nature of Geographic Data	Chap. 4
2/5	The Nature of Geographic Data	Chap. 4
2/10	Georeferencing	Chap. 5
2/12	Georeferencing	Chap. 5
2/17	**Exam 1**	
2/19	Uncertainty	Chap. 6
2/24	Uncertainty	Chap. 6

2/26	Introduction to GPS	GPS manual
3/3	GIS Software/GIS Data Collection	Chap. 7 and 9
3/5	**No Class Meeting – Collect GPS points**	**Student Selected Papers**
3/10, 3/12	***Spring Break, No Classes***	
3/17	**Student Presented Papers and Discussion**	**Student Selected Papers**
3/19	**Student Presented Papers and Discussion**	Chap. 9
3/24	GIS Data Collection	
3/26	**Exam 2**	
3/31	Distributed GIS *(Arboretum Project Due)*	Chap. 11
4/2	Distributed GIS	**Student Selected Papers**
4/7	**Student Presented Papers and Discussion**	**Student Selected Papers**
4/9	**Student Presented Papers and Discussion** *(Outline of Independent Projects Due)*	**Student Selected Papers**
4/14	**Student Presented Papers and Discussion**	
4/16	Analysis	Chap. 12, 13
4/21	Trexler Park Project Discussion, Analysis *(Trexler Park Project Due)*	Chap. 12, 13
4/23	Spatial Analysis	Chap. 14
4/28	**Exam 3**	
4/30	Independent Project	
5/5	***No class, Friday Schedule***	
Final Exam Time - As Scheduled	**Presentation of Independent Projects, Independent Project Reports Due (we will all meet at this time for presentations of independent projects)**	

* Dates for lecture topics and reading assignments are subject to change if we find that we want to spend more or less time on certain topics.
** I may not assign an entire chapter, look on the board for specific pages of assigned reading.

Laboratory – As stated above, for most days, lab will begin approximately one hour into the class time. Following exams we will not have a formal lab, though I will be available to answer questions related to projects or lecture material. For dates followed by "**$**", unless it is heavily raining or snowing we will most likely be outside for lab – dress appropriately, including boots for mud and jackets for warmth!

Date*	Lab
1/20	Introduction to *ArcGIS 9.2* – "ArcGIS Desktop quick tour"
1/22	*Mastering ArcGIS* – Chapter 1
1/27	*Mastering ArcGIS* – Chapter 1
1/29	*Mastering ArcGIS* – Chapter 2
2/3	*Mastering ArcGIS* – Chapter 2
2/5	*Mastering ArcGIS* – Chapter 3
2/10	*Mastering ArcGIS* – Chapter 3
2/12	*Mastering ArcGIS* – Chapter 4
2/17	**Exam 1 – no lab**
2/19	*Mastering ArcGIS* – Chapter 4

2/24	*Mastering ArcGIS* – Chapter 5
2/26	*Mastering ArcGIS* – Chapter 5
3/3$	Introduction to GPS units – Start Arboretum Project
3/5$	Mapping the Cedar Crest Arboretum – Class Project
3/10, 3/12	*Spring Break, No Labs*
3/17	Downloading and Mapping GPS data
3/19	Arboretum Project
3/24	Arboretum Project
3/26	**Exam 2 – no lab, but you may wish to work on your Arboretum project**
3/31$	**Arboretum Project Due at 1pm –** Discussion of Trexler Park Project
4/2 - 4/16$	Habitat and Wildlife Assessment of Trexler Park – Class Project
4/21 – 4/30	**Trexler Park Project Due (4/17 at 1pm),** Independent Projects
Finals Week	**Presentations and Independent Project Reports Due**

* Dates may change to take into account lecture schedule or weather conditions.

Course Policies and Student Responsibilities:
Attendance and Makeup:
Regular attendance is expected, as is the completion of all assignments. You are responsible for the materials covered in this course and are invited to ask questions to clarify any confusion with the subject matter.

***********If you miss an exam, it can only be made up if you notify me prior to the exam time or on the day of the exam and have a valid, documented excuse. Otherwise you will receive a "0" for this exam. For excused absences, you have 1 week (i.e., if the exam is on a Thursday, you have until the following Thursday to make up the exam). Projects and presentations are also to be completed on time. **For every day an assignment is late, the original grade for that assignment will be reduced by 5 points (i.e., if an assignment is 2 days late, the grade for that assignment will be 10 points less than the grade it would have earned if it had been handed in on the original due date).** Assignments cannot be handed in after they have been returned to the class, with the exception of extenuating circumstances. ******************

Extra-credit Policy: No extra credit assignments will be given. If you are having difficulty with concepts in the course, please come to see me and ask questions.

Honor Code
We will follow the rules of the Cedar Crest College Honor Code and the Classroom Protocol code as stated in the Student's Guide Book (Section A.I).

Plagiarism
We will follow the College's policy on plagiarism. Please see the Student's Guide (Section A.I) for a definition of plagiarism and the College's policy on plagiarism. "Anyone who is found to have committed plagiarism will be required to redo the assignment or will get an F for that assignment, based on the severity of the offense. Under certain situations, those who have committed plagiarism may be suspended or expelled from the College. All cases will be reported to the Provost."

College Accommodations Policy
Anyone with documented disabilities who may need academic accommodations should discuss these needs with me during the first two weeks of class. Anyone with disabilities who wishes to request accommodations should contact the Advising Center (x3484).

Final Exam Date
Professors were asked by the Provost's office to include the following statement on our syllabi regarding attendance at the final exam. "Your obligations for this course include attendance at the final exam, on the day and time scheduled by the Registrar's Office. You should not make travel arrangements until the final exam schedule is published; if you must make plans early, you should schedule your travel after the last final exam day." Though we are not having a final exam, we will be using the final exam time to present the independent projects. Half of your independent project grade is based upon giving this presentation, thus you must be present to give it.