GEO 4141C: Geographic Methods and Techniques
Department of Geography
University of South Florida
Spring 2002

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Office Hours: Tuesday 5:00 – 5:30
Monday 5:00 – 5:30
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Others: by appointment

Prerequisites: GEO 4131C and GEO 3164C
Or Consent of the instructor

Course Description

This is an upper-division undergraduate course. The objective of this course is to examine the use of geographic information systems (GIS) for the environmental modeling. An important goal of this course is to provide students with an overview of the power and application of GIS to computer-based spatial models for the environment. Students will be exposed to a range of spatial analytic and modeling tools and applications intrinsic to GIS in applied formats through seminar style presentations and discussions of assigned articles and reports.

The focus of the course will be applied and analytical aspects of GIS on environmental modeling, with some treatment of technical issues related to data sources, data types, data analysis and modeling techniques specific to environmental data. Students will not only learn the basic concepts of GIS-based environmental modeling, they will be exposed to the current state of spatial techniques to manage our environment.
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Upon completion of this course students will be familiar with the scope of GIS application in environmental modeling, they will also have hands-on experience with modeling in a GIS and a GIS-based environmental software Basins (Better assessment of Source and Non-point Source pollution by the EPA). They will also be exposed to environmental models such as USLE, DRASTIC, Prism, GLEAMS, Fathom, Leachm etc. either through class projects or in-depth discussion of case studies.

Text

1. Required: GIS and Environmental Modeling by (Eds.) Clarke,
2. Required: Modeling our world by Michael Zeiler
3. Suggested: Application of GIS to the modeling of Non-Point Source Pollutants by (Eds.) Corwin and Lougue
4. Manual for Basins 3.0: **Download** from http://www.epa.gov/OST/BASINS/

Some additional handouts and scientific articles will be provided to aid understanding of the subject.

Course Components

1. Introduction to fundamental concepts of GIS and Environmental Modeling
2. Introduction to GIS software by ESRI and Basins 3.0 by the EPA
3. Working on class projects
4. Seminar style discussion and participation
5. Term project, paper and presentation

Course Requirements

In addition to regular discussion in class, seminar style **presentation** and **discussion** is a critical component of this class. This facilitates learning. **All students are expected to complete the required readings and to participate in the seminars.**

We will have class projects as well as a term project. Students are required to **work with software** ArcView and Basins for the **Term Project** and present the project to the class. By the third week you will be assigned a region in the US to study. A final term paper will be **due 19th of April**. **No exceptions**. You may work and present your term project individually or in a group. However, each student is expected to turn in his/her own copy of the term paper written in his /her own words. About 3-4 exercises will be assigned over the course of the term which will comprise 10% of your grade.

Class Grading

Mid Term 1	20%
Mid Term 2	20%
Final (Term Paper and presentation)	35 %
Seminar Presentation	10%
Seminar Participation	5%
Exercises	10%
Total	100%

Grading Scale

>= 90%	A
80 – 89%	B
70 – 79%	C
60 – 69%	D
<60%	F

Seminar Presentation

Each week a seminar will be led by groups of roughly 3-4 students (depending on class size) in which we will discuss a specific paper. **All students are expected to complete the required readings and to participate in the seminars**. Note that 10% of your final grade will be allocated to the seminar presentation. All members of the group will receive the same grade. Grading for the seminar presentations will be based upon four criteria: (1) statement of the paper objectives, (2) the main points and conclusions of the paper, (3) issues of interest or concern raised by the seminar leaders, and (4) organization. Also, to encourage dialogue, 10% of your final grade will also be allocated to seminar participation.

Attendance Policy

Your grades will not be affected if you miss a class due to circumstance beyond your control. However, you are highly encouraged to weigh the opportunity costs of missing a class as lectures will greatly aid in understanding of the material. Please arrange to get notes from other students. Please note that notes or tapes from this class are not for sale. Students who anticipate the necessity of being absent from class due to the major observation of a major religious observance must inform me.

Academic Dishonesty

While class projects and term projects may usually be worked on in groups, each student is expected to turn in his/her own copy of report written in his /her own words. Blatant copying will result in zeros on all involved reports. No exception or excuses. Please refer to 2001 – 2002 student handbook pages 12 – 15 for detailed discussion.

Other Notes

Students taking this course come from a variety of backgrounds. Class discussion It is hoped that all students will share thoughts and experience in order to make this a very enjoyable class for everyone.

Week #	Date	Topics
Week 1	**1/11/2002**	**1. What is environmental modeling with GIS** Introduction Course outline Course requirements Grades
Week2	**1/18/2002**	**2. Modeling the environment with GIS** History of GIS and environmental modeling The evolution of GIS The coupling debate How maps inform Utility of maps Display of thematic, spectral and picture data

Visualization surfaces with TIN layers
Raster data and vector data

Reading: Chapter 1, Clarke et al.
Chapter 2, Zieler
Article by : Goodchild

Week 3 **1/25/2002** **3. Fundamentals of GIS**
GIS Data Representation
Fundamentals of GIS
Diverse Application of GIS
Representation of the world
Modeling surfaces
Modeling imaged or sampled data
Modeling discrete features
Comparing Spatial data representation

Reading: Chapter 3, Zieler
Article by Goodchild
Class Project: Introduction to Arcview with extensions

Week 4 **2/1/2002** **4. Modeling with GIS**
Linear modeling with lines
Cell-based modeling with raster
Surface modeling with TINs

Reading: Chapters 8, 9, 10 Zieler
Article by Karimi
Class Project: Introduction to Arcview with extensions

Week 5 **2/8/2002** **5. Environmental modeling with GIS: Modeling**
Frameworks, Paradigms and Approaches
Typology of environmental Modeling
The nature of environmental modeling
Complex environmental systems
Environmental phenomena and complex systems
Modeling with computer

Reading: Chapter 2, Clarke et al.
Article by Brodie
Class Project: EPA and USDA web sites

Week 6 **2/15/2002** **6. Spatial Decision Support Systems and Environmental**
Modeling: An application approach
A flexible, multiuse spatial decision support system

		Applications of SDSS using Environmental Models **Reading**: Chapter 3, Clarke et al. Article by Martin et al.
Week 7	**2/22/2002**	**7. GIS Data Sources and Measurement Technologies** a. Environmental modeling, data and GIS b. Data types, sources and issues c. Remotely sensed data and data capture d. GPS e. Data access and data distribution **Reading**: Chapter 4, Clarke et al. Article by Meinardi
Week 8	**3/1/2002**	**8. Development, calibration and validation of models** a. From the real world to abstract models b. Modeling goals c. Model Structure d. Calibration of models e. Validation of models **Reading**: Chapter 5, Clarke et al. **Class Project**: Software: Introduction Basins
Week 9	**3/8/2002**	**9. Dynamic systems modeling and four dimensional GIS** a. Space-time modeling in a GIS context b. Models and modeling c. Time dimension and the GIS d. Modeling space-time systems **Reading**: Chapter 6, Clarke et al. Article by Burrough Article by Flugel **Class Project**: Software: Basins
Week 10	**3/15/2002**	**Spring Break**
Week 11	**3/22/2002**	**10. Modeling Human-Environmental Systems** a. Key feature of Human-environment models b. Examples of Human-environment models c. Modeling complexity and human environment dynamics **Reading**: Chapter 7, Clarke et al. Article by Horssen **Class Project**: Software: Basins

Week 12	**3/29/2002**	**11. Modeling Physical systems** a. Physical processes in Environmental Modeling b. Models and GIS c. Case studies **Reading**: Chapter 8, Clarke et al. Articles by: Miguel **Class Project**: Software: Basins
Week 13	4/5/2002	**12. Integrative Environmental Modeling** a. Interaction between models b. Uncertainty analysis and model integration c. Approaches to model integration d. User Interface Issues **Reading**: Chapter 9, Clarke et al. Articles by: Burkart et. al Levalloisa et. al
Week 14	**4/12/2002**	**13. Visualization of Environmental data** Discussion of Case studies **Reading**: Chapter 11, Clarke et al. Article by: Behrendt et. al
Week 15	**4/19/2002**	**14. GIS and Environmental modeling where next?** Discussion of case studies **Reading**: Chapter 12, Clarke et al. Article by Lasserrea
Week 16	**4/26/2002**	**Presentation of term paper**
Week 17	**5/3/2002**	**Final**