Geography 59  
Environmental Applications of GIS

Instructor: Xun Shi  
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Lecture Hours: Monday, Wednesday, and Friday, 1:45 p.m. – 2:50 p.m.

Lab Hours: Thursday, 2:00 p.m. – 4:00 p.m.

X-period: Thursday, 1:00 p.m. – 1:50 p.m.

Office Hours: Monday, 3:50 p.m. – 4:50 p.m.  
Friday, 3:50 p.m. – 4:50 p.m.

Classroom: Rm 008, Fairchild

Lab room: Rahr Lab (Rm 013, Fairchild)

TA: Cynthia Chen  
cynthia.chen@dartmouth.edu

Course Webpage: blackboard.dartmouth.edu

1. Course Objectives
This course focuses on the uses of GIS techniques in solving practical environmental problems. The student objectives of this class are:

- Learning ideas of how GIS can be applied to various fields of environmental studies and applications through examining real examples concerning soils, watershed hydrology, vegetation, landuse/land cover, climate, pollutions, landscape ecology, and natural hazards.
- Learning fundamental knowledge and techniques required in application projects for solving environmental problems, including the methodology of starting and running such projects, and spatial analytical techniques that are frequently used in such projects.
- Developing individual experience in the use of GIS in solving environmental problems through execution of a term project, and presenting it both orally and in written form.

The course is made of three components: the lectures, the lab exercises, and the term project. In the lectures, specific application examples are examined. The ideas, procedures, and the techniques in these examples are analyzed, explained, and discussed. In the lab part, the students gain hands-on experience on those spatial analytical techniques that are frequently used in the environmental applications of GIS. The students complete term projects to obtain experiences in solving real-world environmental problems with GIS. The topics of the term projects and the software tools used for the projects are chosen by the students themselves, but should be approved by the instructor.
2. **Prerequisites**
   Geography 58 “Introduction to GIS”.

3. **Computing Environment and Software**
   ArcGIS will be used in the lab part of this class. ArcGIS runs under Microsoft Windows environment on IBM compatible PCs.

4. **Grading**
   There are six exercises, one exam and one term project in this course.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Lab Exercises</td>
<td>30%</td>
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<tr>
<td>Class Presentation</td>
<td>15%</td>
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<tr>
<td>Term Project</td>
<td>35%</td>
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<td>Exam</td>
<td>20%</td>
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5. **Course Materials**
   - **Text**

   - **References**


6. Intended Schedule

Week 1:
Lecture 1. Introduction to Geog 59 (March 26)

Lecture 2. Introduction to Environmental Applications of GIS (March 28)
Reading:

Lab 0. Reviewing ArcGIS: ESRI Virtual Campus Exercises

Week 2:
Lecture 3. Introduction to Environmental Data (March 31)
Reading:
- USGS Digital Raster Graphic (DRG) Program (http://mcmcweb.er.usgs.gov/drg/)
- USGS Digital Line Graph Data (http://edc.usgs.gov/glis/hyper/guide/usgs_dig)

Lecture 4. Starting and Running a GIS Application Project (April 2)

Lecture 5. Some Term Project Ideas (April 4)

Lab 0. Reviewing ArcGIS: ESRI Virtual Campus Exercises (cont.)

Week 3:
Lecture 6. Terrain Analysis (I): Extracting Primary Landform Information from DEM (April 7)
Reading:
- Burrough and McDonnell, 1998, Chapter 8, pp. 190-192

Lecture 7. Terrain analysis (II): Extracting Watershed Information from DEM (April 9)
Reading:
- Burrough and McDonnell, 1998, Chapter 8, pp. 193-198

Lecture 8. Terrain Analysis (III): Other Useful Raster Operations (April 11)
Reading:
- Burrough and McDonnell, 1998, Chapter 8, pp. 184-189
- DeMers, 2002, Chapter 4
Lab 1. Downloading USGS DEM and Creating a 3D Color Terrain Map (Lab 0 Due).

Week 4:
Lecture 9. Student Presentation: Problem Analysis and Definition (April 14)

Lecture 10. Spatial Interpolation I: Global Methods and Local Methods (April 16)
Reading:
• Burrough and McDonnell, 1998, Chapter 5

Lecture 11. Spatial Interpolation II: Kriging (April 18)
Reading:
• Burrough and McDonnell, 1998, Chapter 6

Lab 2. Extracting Primary Landform Information from DEM (Lab 1 due).

Week 5
Lecture 12. Spatial Interpolation V: Kriging (Cont.) (April 21)
Reading:
• Burrough and McDonnell, 1998, Chapter 6

Lecture 13. Student Presentation: Logical Design (April 23)

Lecture 14. Student Presentation: Logical Design (cont.) (April 25)

Lab 3. Extracting Watershed Information from DEM (Lab 2 due)

Week 6:
Lecture 15. Midterm Exam (65 minutes) (April 28)

Lecture 16. Classification (I): Supervised Classification (April 30)
Reading:
• TBA

Lecture 17. Classification (II): Supervised Classification (Cont.) (May 2)
Reading:
• Openshaw and Openshaw, 1997, Chapter 5

Lab 4. Spatial Interpolation

Week 7:
Lecture 18. Classification (III): Unsupervised Classification (May 5)
Reading:
• TBA

Lecture 19. Classification (IV): Fuzzy Logic (May 7)
Reading:
• Burrough and McDonnell, 1998, Chapter 11
Lecture 20. Spatial Pattern Analysis (May 9)
Reading:
• DeMers, 2002, Chapter 4

Lab 3 due.

Week 8:
Lecture 21. Spatial Correlation Analysis (May 12)
Reading:
• TBA

Lecture 22. Dispersion Model (May 14)
Readings:
• Burrough and McDonnell, 1998, pp. 199

Lecture 23. GIS in Environmental Health Study (May 16)
Reading:

Week 9:
Lecture 24. Student Presentation: The Whole Project (May 19)

Lecture 25. Student Presentation: The Whole Project (cont.) (May 21)
Lecture 26. Student Presentation: The Whole Project (cont.) (May 23)

Week 10:
Lecture 27. Course Summary (May 28)

Term project report due.