USP 543  
Geography Applications to Planning  
Spring 2003, 3 credit hours  
Thursdays, 4:00 – 6:20 PM  
SB2, room 247

Course description
The goal of the course is to develop an understanding of geographic (spatial) modeling and its applications in urban and regional planning. It discusses spatial models - from major theoretical constructs of urban development to the “traveling salesman” network problem to 3-D representations of urban landscapes - and their use for analysis and prediction. Students will further explore geographic information systems and their advanced analytical and modeling capabilities and will acquire skills in network, surface and 3-D analyses. Discussions of real-life GIS applications to planning will serve to synthesize these skills and to facilitate a successful completion of an individual research project. We will conclude by exploring the role of GIS in the emerging field of planning support systems, an integrated technological approach facilitating planners-community interactions.

In addition to weekly meetings for lectures and student-led discussions, the coursework includes exercises from Extending ArcView GIS manual or Using ArcGIS digital books, two brief assignments and an individually designed project to be completed through an independent work in the computer lab. The course utilizes WebCT, an online educational tool, to support the instruction (URL is http://www.webct.pdx.edu/).

Instructor
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Office hours: 4:00PM to 6:00PM on Tuesdays, 1:00PM to 3:00PM on Thursdays, and by appointment.

Reading: at PSU Bookstore
• Additional online and hard-copy reading will be assigned weekly.

Evaluation Method
Final grades will be established on the basis of:
• Exercises from either Extending ArcView GIS or Using ArcGIS digital books (10%);
• Assignments (30%): two, 15% each;
• Research project (35%): report 25%, in-class presentation 10%;
• Participation (15%): regular participation in discussions of the assigned reading is expected;
• Leading one discussion (10%): 2-3 students prepare for and lead a discussion of assigned reading a week, each submitting a 1-page typed review of one article.
Topical Outline and Required Weekly Reading

WEEK 1.
Course introduction. Spatial analysis and modeling in GIS. GIS and its place in short-term and long-term planning.

2. Models, their types and uses.
4. GIS: basic and advanced analytical capabilities.

Assigned reading for Week 2


Discussion articles for Week 2


WEEK 2
Spatial data models. Data models for transportation. Modeling linear features in GIS.

1. Modeling in GIS: spatial data models.
2. Vector and raster data models
3. Linear features & linear referencing systems
4. Dynamic segmentation in GIS

Assigned reading for Week 3


Discussion articles for Week 3


**WEEK 3**
Graph theory for transportation modeling. Transportation networks.

1. Networks and their types.
2. Using graph theory to analyze networks.
3. Modeling networks in GIS
4. ArcView Network Analyst
5. GIS for transportation planning

**Assigned reading for Week 4**


**Discussion articles for Week 4**


**WEEK 4**
Distance and urban spatial structure. Spatial interaction and gravity models.

1. Models of land use and urban spatial structure
   - von Thunen
   - Burgess
   - Hoyt
   - Harris and Ullman
   - Polycentric city
2. Spatial interaction and its types
3. Modeling spatial interaction: gravity models
4. Types of gravity models
5. Gravity models for transportation planning

**Assigned reading for Week 5**

- Jeyapalan, K. *Remote Sensing*. In *Urban Planning and Development Applications of GIS*. Easa, Said, and Yupo Chan, Eds. ASCE, 2000, **Ch. 3**.

**Discussion articles for Week 5**


**WEEK 5**

Modeling surfaces. Grids, their types and uses. Raster modeling in GIS.

1. Surface data and its representation
2. Raster data models in GIS. Grids.
3. Interpolating point data and its uses
4. ArcView Spatial Analyst

**Assigned reading for Week 6**

- Dalton, Kristina. *Cultural and Natural Resources*. In *Urban Planning and Development Applications of GIS*. Easa, Said, and Yupo Chan, Eds. ASCE, 2000, **Ch. 10**.

**Discussion articles for Week 6**


**WEEK 6**

1. Population density and urban planning
2. Density modeling; population density surfaces
3. Map algebra; neighborhood analysis with raster data
4. Using grids for forecast, travel, and socioeconomic data allocation

Assigned reading for Week 7

Discussion articles for Week 7

WEEK 7
Digital elevation modeling. 3-D modeling and visualization in GIS

1. 2.5-D and 3-D data and its representation
2. Digital elevation models and their applications
3. Modeling slope, aspect, visibility, elevation profile
4. 3-D modeling and visualization in ArcGIS and ArcView

Assigned reading for Week 8

Discussion articles for Week 8

WEEK 8
3-D modeling and visualization in planning applications

Guest lecture: Kevin Martin (GIS Analyst), City of Portland Bureau of Planning

Assigned reading for Week 9
Discussion articles for Week 9


WEEK 9
Applications of GIS to predictive planning. Planning Support Systems

1. Spatial Decision Support Systems
2. Planning Support Systems: definitions, goals, requirements

WEEKS 10 & 11: Student presentations
<table>
<thead>
<tr>
<th>Week/Date</th>
<th>TOPICS and MAIN ASSIGNED READING</th>
<th>EXERCISES</th>
<th>ASSIGNMENTS</th>
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<tr>
<td>Week 1 4/3</td>
<td>Course introduction. Geography contributions to planning. Spatial modeling and GIS. <em>Urban Planning</em>, Ch. 1, 2, 4, 5</td>
<td>Optional: complete a free Module 1 “Learning ArcGIS I” online at <a href="http://campus.esri.com/">http://campus.esri.com/</a></td>
<td>N/A</td>
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<tr>
<td>Week 2 4/10</td>
<td>Spatial data models. Data models for transportation. <em>Urban Planning</em>, Ch. 7, 8, 11</td>
<td>Using ArcGIS Spatial Analyst: Ch. 1, 2, 6 <em>Due April 17</em></td>
<td>N/A</td>
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<td>Week 3 4/17</td>
<td>Graph theory for transportation modeling. Transportation networks. <em>Urban Planning</em>, Ch. 6</td>
<td>Using ArcGIS Spatial Analyst: Ch. 7, pp. 120-132 <em>Due April 24</em></td>
<td>Assignment 1 <em>Due May 1</em></td>
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<td>Week 4 4/24</td>
<td>Distance and spatial interaction. Gravity models and flows. <em>Urban Planning</em>, Ch. 3</td>
<td>Using ArcGIS Spatial Analyst: Ch. 7, pp. 184-189 <em>Due May 1</em></td>
<td>Assignment 2 <em>Due May 15</em></td>
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<td>Week 6 5/08</td>
<td>Modeling urban density. Interpolating surfaces. <em>Urban Planning</em>, Ch. 9 Research proposal due via WebCT email by 4 PM</td>
<td>Using ArcGIS 3D Analyst: Ch. 2 <em>Due May 15</em></td>
<td>Working on individual research projects</td>
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<td>Week 7 5/15</td>
<td>TIN surfaces. 3-D modeling. Analyzing 3-D surfaces <em>Urban Planning</em>, Ch. 12</td>
<td>Using ArcGIS 3D Analyst: Ch. 6 <em>Due May 22</em></td>
<td>Research report due by Thursday, June 12, 3:30 PM</td>
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<td>Week 8 5/22</td>
<td>3-D modeling and visualization in planning applications.</td>
<td>N/A</td>
<td>N/A</td>
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<td>Week 9 5/29</td>
<td>Applications of GIS to predictive planning. Planning Support Systems.</td>
<td>N/A</td>
<td>N/A</td>
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<td>Week 10 6/05</td>
<td><strong>Student presentations</strong></td>
<td>N/A</td>
<td>N/A</td>
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<td>Week 11 6/12</td>
<td><strong>Student presentations</strong> The class meets Thursday, June 12, 3:30 till 5:20 PM</td>
<td>N/A</td>
<td>N/A</td>
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