

*GEOG 474/574 and 474/574 Lab Fall 2019*

**GEOG 474/574-SO1D and 474/574L-SO1D:  
Vector and Raster Modeling and Lab  
South Dakota State University  
Fall 2019 Course Syllabus  
Online Course  
3 Semester Credits**

**Instructor: Peggy Harper**

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**Office Hours Mon. - Frid. 12-5**

**Course Description**

This is an advanced GIS course that builds on the skills and processes learned in the introductory GIS course and introduces various raster and vector data modeling techniques. The course text and exercises provide experience with a variety of geoprocessing tools used to analyze GIS data and create GIS data models.

**Catalog Description**

This course introduces basic concepts of vector and raster modeling in Geographic Information Systems (GIS) with special emphasis on construction and use of raster digital elevation models (DEMs). Provides in-depth experience with a range of geoprocessing techniques for handling and analyzing GIS data. Topics include vector processing in a model framework, weighted suitability modeling, path finding, modeling viewsheds, constructing surfaces from point samples, and spatial hydrologic modeling. Builds on the skills and techniques learned in the introductory GIS course or equivalent. Corequisites: 474L-474/574L-574.

**Instructional Methods**

This course is taught online and will utilize instructional methods including readings, group discussions, case studies, and hands-on use of GIS software.

**Goals**

- To develop an understanding of the fundamental concepts and principles of GIS data models
- Apply GIS to design a model in solving problems
- Gain a further understanding of the real-world applications of GIS and how to apply data models to those applications.

**Course Structure**

For each module you will be expected to:

- Complete assigned readings
- Participate in weekly discussion forum
- Complete weekly exercises

### Required Textbooks

- Chang, K.T., 2015. *Introduction to Geographic Information Systems* (8th edition). McGraw-Hill education (ISBN: 978-0078095139)
- Keraneen, Kathryn; Kolvoord, Robert, 2017. *Making Spatial Decisions Using ArcGIS Pro: A Workbook*. ESRI Press. (ISBN - 9781589484849)

### Lab Assignments

The lab assignments provide the opportunity to implement modeling principles that are introduced in the readings and discussions. Please name each lab assignment Ex#\_Firstinitial\_Yourlastname.pdf (For example, Assignment 1 would be Ex1\_P\_Harper.pdf).

**Exercises are due on Sunday by 11:30pm. Late assignments will receive a 5 point late penalty for each week the assignment is late. Late assignments will not be accepted after two weeks from the due date.** If an extension is needed due to an emergency circumstance or other school approved absence, the instructor must be contacted in advance, not after the due date. Contact the instructor if you have any questions regarding this policy.

### Quizzes and Exams

There will be 3 quizzes and 1 exam for this course. There will be a quiz at the end of modules 1, 2 and 3 and then the final exam. Quiz and final exam questions will come from the textbook and supplemental readings and exercises. Questions will be a combination of multiple choice, true/false, short answer and discussion.

### Final Project

The final project should identify a spatial problem and solve the problem by developing a GIS model. The project must be original research work and needs to employ geoprocessing tools and not be a simple mapmaking project. Students should submit a final project idea as soon as possible but **no later than the end of Module 2** to make sure your project meets project requirements.

Undergraduate students can work submit a group project. Group size is two. Graduate students are encouraged to associate the final project to their thesis topic.

The Final Project should include descriptions of geographic questions, used within the research, the data selected and why, the methods and analysis used and why, results and conclusion. The conclusion should include ideas for future research and any changes the you would make to your research.

The Final Project submission should include:

- 1) A comprehensive literature review based on the questions and problem you are addressing in your research (1-3 pages).
- 2) A 10-15 narrated (audio or text descriptions) powerpoint presentation that describes the problem and GIS data model created to help solve the problem and why this model was used.

- 3) A research paper following the APA format, including abstract, introduction, methodology, results, discussion, conclusion and references. Papers should have a word count of 2500 - 4000 for undergraduate and 4000-6000 for graduate.

## **Evaluation Rubric and Course Outline**

### **Online Discussions Guidelines**

Students are expected to participate in the online discussions in the following manner:

- Enter Discussions a minimum of 2 days a week, with the 1st post by Wednesday of the week.
- Complete the assigned reading before participating in discussions. Your participation points are derived from the depth of your responses. The discussion should be thoughtful, informative, and respectful. Use the appropriate Discussion Forum and include the "subject" you are addressing.
- Read other students' posts, post an in-depth comment/reply, or ask/answer questions about the topic under study. Add any new information you may have found in your reading.
- Remember to cite your posts when using content from the readings.
- Return to the site later in the week and review questions/further discussion on the topic. Be sure to read and answer any comments/questions that students have about your previous posts.
- Points for participation in the discussions will be assigned according to the depth and number of postings following the grading rubric below.

### **General Rules for Online Discussion Netiquette**

- Respect others' ideas, feelings, and experiences.
- Be courteous. It is important to be honest and express yourself freely, but be sure that you include praise as well as constructive criticism.
- When posting responses, back up your assertions with data and evidence. These are especially important if you disagree with a response or topic.
- Remember that online communication lacks non-verbal cues. Make every effort to be clear and concise in communication.
- Never use all capital letters. This is considered "SHOUTING!"
- Humor can be misinterpreted due to the lack of non-verbal clues. You may wish to use emotion-icons (such as smiley faces.)

### **Weekly Discussion Rubric**

<b>Evaluation Criteria</b>	<b>Full Credit</b>	<b>Half Credit</b>	<b>No Credit</b>
<b>Quantity of Participation</b>	Posts the assignment and at least 2 replies to other students giving honest feedback.	Responds to assignment and 1 other student	Only posts assignment. <b>Does not respond</b> to discussion question.
<b>Frequency of Participation</b>	Discussion is posted at least 48 hours before due date. Returns to read replies and answer questions of students replying to his/her posts.	Discussion is posted on the discussion due date &/or does not return to answer questions.	Responds to discussion after due date or not at all.

<b>Quality of Information</b>	<p>Discussion clearly relates to main topic and adds new concepts/new information about the subject.</p> <p>Uses references in at least one post each week to support comments.</p> <p>Asks pertinent questions, and makes in-depth comments about the subject when replies to other students.</p>	<p>Post clearly relates to the main topic but adds no new concepts to discussion &amp;/or uses no references to document comments.</p> <p>Makes simple comments about the subject when replies to other students.</p>	<p><b>Makes simple replies to other's students with no depth.</b></p> <p>Discussion has little or nothing to do with topic.</p> <p><b>No replies to other students.</b></p>
<b>Quality of Information</b>	<p>Discussion clearly relates to main topic and adds new concepts/new information about the subject.</p> <p>Uses references in at least one post each week to support comments.</p> <p>Asks pertinent questions, and makes in-depth comments about the subject when replies to other students.</p>	<p>Post clearly relates to the main topic but adds no new concepts to discussion &amp;/or uses no references to document comments.</p> <p>Makes simple comments about the subject when replies to other students.</p>	<p><b>Makes simple replies to other's students with no depth.</b></p> <p>Discussion has little or nothing to do with topic.</p> <p><b>No replies to other students.</b></p>
<b>Critical Thinking</b>	<p>Post clearly shows the student has studied the topic and has given thought to the topic under discussion.</p> <p>Discussion is accurate and logical.</p>	<p>Post shows student studied some of the topic under discussion.</p> <p>Discussion is accurate but lacks depth.</p>	<p>Post shows no evidence that the student has read or studied the topic.</p> <p><b>Discussion lacks depth.</b> May be presented in a rambling manner.</p> <p><b>Post is inaccurate &amp;/or is unclear.</b></p>
<b>Netiquette</b>	<p>Uses proper on-line netiquette with all posts asking questions and giving feedback to other students.</p>	<p>Uses proper on-line netiquette with most posts.</p>	<p><b>Lack of response to students.</b></p> <p>Is at times sarcastic &amp;/or negative with responses.</p> <p>Inappropriate use of humor.</p>

## Course Outline

### Module 1 - Getting Started; Introduction to GIS Modeling

Read *Introduction to Geographic Information Systems* - Chapters 1, 2, 9, and 18

Lab Exercises 1 and 2

Weekly Discussion Forums 1, 2, and 3 and Chapter 5 of The ArcGIS Book

Download *The ArcGIS Book*, 2nd ed. [www.theARCGISBook.com](http://www.theARCGISBook.com)

Model Builder - Pancake

Quiz 1

	Due Date	Points
• <b>Week 1 - Modeling Concepts</b>		
• Weekly Discussion Forum 1	9/1	10
• Post and respond, get to know your classmates		
• Post and respond regarding The ArcGIS Book Chapter 5		
• Lab Exercise 1		
• Getting Started - Beginning of Semester Checklist	9/1	10
• Build a “Model” recipe		
• <b>Week 2 - Coordinate Systems (Labor Day Holiday, 9/2/19)</b>		
• Weekly Discussion Forum 2		
• Post and Respond regarding Chapter 2 Readings	9/8	10
• Weekly Discussion Forum 3		
• Post and Respond regarding Chapter 9 Readings	9/8	10
• Lab Exercise 2		
• Begin ESRI Web Course - Getting Started with ArcGIS Pro	(9/15	50)
• <b>Week 3 - GIS Models and Modeling</b>		
• Weekly Discussion Forum 3		
• Post and Respond regarding Chapter 18 Readings	9/15	10
• Lab Exercise 3		
• Complete ESRI Web Course - Getting Started with ArcGIS Pro	9/15	50
• <b>Module 1 Quiz - Take one of the following ESRI Courses</b>	9/15	25
• Spatial Analysis and Modeling with ArcGIS Pro, or		
• Building Geoprocessing Models Using ArcGIS Pro (more advanced)		

**Submit a one page description of what you learned in the course and how you can apply models and Model Builder to your research project for this course.**

<b>Total Points for Module 1</b>	<b>125</b>
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### Module 2 - Vector and Raster Data Modeling

Read *Introduction to Geographic Information Systems* - Chapters 3, 4, 11, and 12

Lab Exercises 4, 5, 6, and 7

Weekly Discussion Forums 4, 5, 6, and 7

Module 2 Quiz

Submit Project Idea for Final Project by end of Module 2

- **Week 4 - Vector Data Model**

- Weekly Discussion Forum 4
  - Post and Respond regarding Chapter 3 Readings 9/22 10
- Lab Exercise 4 - Using Model Builder
  - Build a Model to Connect Mountain Lion Habitat
  - ESRI Tutorial 9/22 50

For the assignment, a 1-2 page paper will need to be submitted, discussing the benefits of building a model, pointing out any disadvantages of using the model for this particular application. (Compare and contrast the use of the model vs not using the model.) Also, include in the discussion any of the model elements that would be useful within your research project.

- **Week 5 - Vector Data Analysis**

- Weekly Discussion Forum 5
  - Post and Respond regarding Chapter 11 Readings 9/29 10
- Lab Exercise 5
  - Module 1, Project 1- An explosive situation in Springfield, VA, pages 3-37
  - *Making Spatial Decisions Using ArcGIS Pro, A Workbook* 9/29 50

For **Lab Exercise 5**, submit the **maps** that you created at the end of the exercises as a **pdf**. A **pdf file only** (no web links, no other file formats) is needed for grading. You **also** need to **submit a model schematic** based on the geoprocesses that you used in the exercise. Model Builder can be used to create the model. You can limit your model to one section of the exercise.

- **Week 6 - Raster Data Model**

- Weekly Discussion Forum 6
  - Post and Respond regarding Chapter 4 Readings 10/6 10
- Lab Exercise 6
  - Module 1, Project 2- Skirting the spill in Mecklenburg, CO, NC
    - *Making Spatial Decisions Using ArcGIS Pro, A Workbook* 10/6 50
    -
  - For **Lab Exercise 6**, submit the **maps** that you will create at the end of the exercises as a **pdf**. A **pdf file only** (no web links, no other file formats) is needed for grading. In addition, you **will** need to **submit a model schematic** based on the geoprocesses that you used in the exercise and a short paragraph describing the model. Model Builder can be used to create the model. You can limit your model to one to two sections of the exercise.

- **Week 7 - Raster Data Analysis (Native American Day Holiday, 10/14/19)**

- Weekly Discussion Forum 7
  - Post and Respond regarding Chapter 12 Readings 10/13 10
- Lab Exercise 7
  - Module 5, Project 1- Calculating unsupervised classification of the Chesapeake Bay
    - *Making Spatial Decisions Using ArcGIS Pro, A Workbook* 10/13 50

For **Lab Exercise 7**, submit the **maps** that you will create at the end of the exercises as a **pdf**. A **pdf file only** (no web links, no other file formats) is needed for grading. In addition, you **will** need to **submit a model schematic** based on the geoprocesses that you used in the exercise

and a paragraph describing the model and any processes you may have added to the model. Model Builder can be used to create the model. You can limit your model to one to two sections of the exercise.

**Module 2 Quiz** 10/13 25

**Total Points for Module 2** **265**

### **Module 3 - Applying Models in Real World**

Read *The ArcGIS Book* - Chapter 8

Read *Introduction to Geographic Information Systems* - Chapters 13, 14 and 15

Lab Exercises 8, 10, 11, 12, and 13

Weekly Discussion Forums 8, 10, 11, 12 and 13

Project Ideas for Final Project should be completed

#### **• Week 8**

##### **• Weekly Discussion Forum 8**

- Post and Respond regarding Chapter 8, The ArcGIS Book Readings 10/20 10

##### **• Lab Exercise 8**

- Module 6, Project 1- Calculating supervised classification of the Chesapeake Bay
  - *Making Spatial Decisions Using ArcGIS Pro, A Workbook* 10/20 50

- For **Lab Exercise 8**, submit the **maps** that you created at the end of the exercises as a **pdf**. You **also** need to **submit a model schematic** based on the geoprocesses that you used in the exercise. Model Builder can be used to create the model.

#### **• Week 9 - Terrain Mapping and Analysis**

##### **• Weekly Discussion Forum 9**

- Post and Respond regarding Chapter 13 Readings 10/27 10

##### **• Lab Exercise 9**

- Module 9, Project 1 - George Washington National Forest, VA
  - *Making Spatial Decisions Using ArcGIS Pro, A Workbook* 10/27 50

- For **Lab Exercise 9**, submit the **maps** that you will create at the end of the exercises as a **pdf**. In addition, you **will** need to **submit a model schematic** based on the geoprocesses that you used in the exercise. In addition, you need to submit a one-page paper describing the model and any changes you may make to the process used in the exercise, using your knowledge of model building. Model Builder can be used to create the model.

#### **• Week 10 - Viewshed and Watershed Analysis**

##### **• Weekly Discussion Forum 10**

- Post and Respond regarding Chapter 14 Readings 11/3 10

##### **• Lab Exercise 10**

- Module 2, Project 1 - Coastal Flooding from Hurricane Katrina
  - *Making Spatial Decisions Using ArcGIS Pro, A Workbook* 11/3 50

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•	For <b>Lab Exercise 10</b> , submit the <b>maps</b> that you will create at the end of the exercises as a <b>pdf</b> . In addition, you <b>will</b> need to <b>submit</b> a <b>model schematic</b> based on the geoprocesses that you used in the exercise. Also, you need to submit a one-page paper describing the model and any changes you may make to the process used in the exercise, using your knowledge of model building. Model Builder can be used to create the model.	
•	<b>Week 11 - Spatial Interpolation (Veteran' Day Memorial Holiday, 11/11/19)</b>	
•	Weekly Discussion Forum 11	
•	Post and Respond regarding Chapter 15	11/10 10
•	Lab Exercise 11	
•	<i>I Can See for Miles and Miles</i> - ESRI Tutorial	
•	<i>Aloha! A GIS Vacation</i> - ESRI Tutorial	11/10 50
•	Submit a review of each of the tutorials (2-4 pages in total) emphasizing	
•	the use of models.	
•	<b>Module 3 Quiz</b>	11/10 25
	<b>Total Points for Module 3</b>	<b>265</b>

#### Module 4 - Imagery and 3D Models

Read *The ArcGIS Book* - Chapter 6, Mapping the Third Dimension

Post from your research on an additional 3D GIS applications

Lab Exercises 14 and 15

Weekly Discussion Forums 14, 15 and 16

Final Project

Final Exam

#### •Week 12 - A Mapping a New Perspective

•	Weekly Discussion Forum 12	
•	Post and Respond regarding Progress of final project	
•	and Chapter 6, <i>The ArcGIS Book</i>	11/17 10
•	Lab Exercise 12 - Work on your final project	

#### •Week 13 - A Mapping a New Perspective

•	Weekly Discussion Forum 14	
•	Post and Respond regarding research on 3D GIS modeling	11/24 10
•	Lab Exercise 14	
•	Complete one of the two ESRI tutorials and submit 2-3 page review	
•	Terrain Analysis Using ArcGIS Pro	
•	ESRI Web Course	
	Submit a review of the tutorial (2-3 pages) emphasizing	
	the use of models.	



OR

- 3D Visualization Using ArcGIS Pro
  - ESRI Tutorial 11/24 50Submit a review of each of the tutorial, 2-3 pages, emphasizing the use of models.

•**Week 14 - Thanksgiving Recess, 11/27-12/1/19, *\*No assignments due this week\**.**

- **Week 15 - Final Exam and Projects Due**
- Weekly Discussion Forum 15
  - Post and Respond regarding Progress of Final Project 12/8 10Use this time to work on final project.

**Total Points for Module 4 80**

**Final Project Due 12/15 100**

**Final Exam (12/12-18) 12/18 100**

**Total Course Points - 935**

**A = 935-835, B = 834-734, C = 733-633, D = 632-531, F = ≤ 531**

All assessments are to be considered individual assessments. Any collaboration on any assignment will be considered academic dishonesty, without exception.

#### **Attendance Policy**

Attendance is dependent on active participation in the completion of all group learning activities. Attendance is not based on total login time but active participation to complete goals of the learning activity.

Students are responsible for staying current with the discussions and class activities. Instructor's determination of whether or not the student has met the requirement of "active participation" during group learning activities will be based on quality, timeliness, and the value of discussion postings.

#### **Online Protocols (Netiquette)**

Online protocols, or netiquette, are a way of defining professionalism through network communications. The following core rules delineate what should and should not be done with regards to online communication in order to maintain common courtesy.

- Use correct grammar, sentence structure and punctuation.
- Think about what you wrote and edit before posting your message.
- Proof read what you write several times before posting.
- Be clear and concise. Explain your thoughts and ideas thoroughly, but get to the point.
- Use proper grammar, sentence structure, and punctuation.
- Think about what you wrote and edit before you hit send or post.
- Proof what you are going to send more than once.
- Be clear and concise. Explain your thoughts and ideas thoroughly, but get to the point.

- Use bullets, multiple paragraphs, so that your point is clear.
- Share tips and provide guidance to your classmates. Ask your classmates for feedback. Ask your classmates questions.
- Do not put your classmates down, always demonstrate courtesy and respect.
- Do not verbally attack your classmates because of their opinions.
- Do not harass, threaten, or embarrass your classmates or instructor.
- Do NOT use offensive language. Do not use slang. Be humorous, do not be sarcastic. Always use professional language.
- Be open minded. We are all here to learn from each other. Dissenting opinions, when presented respectfully, are welcome.
- Reference sources, the textbook, your classmates. Cite if necessary. Better yet, use your own understanding of the work, avoiding direct quotes, and then citing the author and source of the original idea.
- Try to respond to discussion posts within a 24-hour period.
- Be patient when waiting for a response, being respectful of your classmates' schedules.
- Share your online schedule with others, as needed.

### **ADA Statement**

Any student who feels s/he may need an accommodation based on the impact of a disability should contact Nancy Hartenoff Crooks, Coordinator of Disability Services (605) - 688-4504 or Fax, (605) – 688 – 4987, to privately discuss your specific needs.

The Office of Disability Services is located in room 065, the Student Union.

### **Diversity and Inclusion**

In this class, people of all ethnicities, gender identities, religions, ages, sexual orientations, disabilities, socioeconomic backgrounds, regions, and nationalities are strongly encouraged to share their perspectives and experiences.

Over the course of the semester, please honor the uniqueness of your fellow classmates and refrain from personal attacks or demeaning comments of any kind. If you feel your differences may in some way isolate you from South Dakota State University's community or if you have any specific accommodations, please speak with me about your concerns and what we can do together to help you become an active and engaged member of our class and community.

### **Freedom in Learning Statement**

Students are responsible for learning the content of any course of study in which they are enrolled. Under Board of Regents and University policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any courses of study.

Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should first contact the instructor of the course. If the student remains unsatisfied, the student may contact the department head and/or dean of college which offers the class to initiate a review of the evaluation.

### **Student Academic Integrity and Appeals**

The University has a clear expectation for academic integrity and does not tolerate

academic dishonesty. University Policy 2.4 sets forth the definitions of academic dishonesty, which includes but is not limited to, cheating, plagiarism, fabrication, facilitating academic dishonesty, misrepresentation, and other forms of dishonesty relating to academics. The Policy and its Procedures also set forth how charges of academic dishonesty are handled at the University. Academic Dishonesty is strictly proscribed and if found may result in student discipline up to and including dismissal from the University.

### **Guidelines for Success**

Taking an online class is an amazing experience. Success, though, is up to you, the student. The Instructor's goal is for each and every one of you to get the most out of this course whether or not you go on to take another course in GIS. You should be able to put what you have learned to excellent use. Read the guidelines below. Refer to them often. If you do, you will achieve all of the stated learning outcomes, and more.

- 1) Read this Syllabus. Read it often. If you have any questions, please ask.
- 2) Ask questions.
- 3) Login to the course daily. Login in at whatever time works best for you. If you check in often and at various times you will always be up to speed on what is happening in the course.
- 4) At the beginning of each module, read the textbook chapters first.
  - a. Refer to your textbook often.
  - b. The textbook will provide an increased depth of learning and will allow you to fully participate in the discussion questions and assignments.
  - c. It is not enough to know how to do something; you need to know why you are doing it.
- 5) Review the materials in the Content section in D2L for each module.
  - a. Take your time, and view and absorb the material.
  - b. Bookmark pages that you find especially relevant.
  - c. Take notes on items that really speak to you and/or you want to learn more about.
- 6) Turn in assignments on time.
  - a. Check the dropbox for items that are due.
  - b. Check the calendar in this syllabus.
  - c. After turning in your assignment via the dropbox, verify that it was turned in.
    - i. You will receive a D2L e-mail verifying that your assignment was received.
    - ii. Again, check the dropbox. It will show when your assignment was submitted.
- 7) The discussion forums are extremely important. You will be graded on your level and quality of participation.
- 8) Utilize critical thinking skills.
  - a. Critical thinking is the ability to think clearly and rationally.
  - b. The Critical Thinking Community
- 9) The experience of this course is what you make of it. Participate, communicate, collaborate, and discuss.
- 10) Go the extra mile.
  - a. Take the lead in an online discussion.
  - b. Introvert or extrovert? It does not matter online, no matter your personality you can shine and stand out.
  - c. Encourage your classmates. Make helpful suggestions.
  - d. Take an active role with informed comments
  - e. Maintain a positive atmosphere.
  - f. This course will reinforce respect and value others ideas.
  - g. Encourage others so that they can achieve their goals, too.

11) Always be respectful and use proper grammar when communicating with the instructor and your classmates.

12) Think about the big picture. How will you use GIS today? Tomorrow? In the future?