South Dakota State University

GEOG 474/574 - S01, 3 Credits
GIS: Vector & Raster Modeling
Course Syllabus (Fall 2018)

Course Instructor: Dapeng Li, Ph.D.

Meeting Time: Mon 3:00-3:50 PM

Meeting Location: Wecota Hall, Room 0002

Office Hours: Mon. & Tue. 1:00 - 3:00 PM (or by appointment)

Office & Phone: Wecota Annex 413, (605) 688-4620

Email: dapeng.li@sdstate.edu (primary contact)

Lab Section

SECTION	LAB INSTRUCTOR	DAYS	LOCATION	MEETING TIME
474/574L S01	Dinesh Shrestha	Mon	Wecota Hall 014	4:30 PM – 6:20 PM
		Fri	Wecota Hall 014	9:00 AM – 10:50 AM

Lab Instructor

Name	E-mail	Phone	Office
Dinesh Shrestha	dinesh.shrestha@jacks.sdstate.edu	605-592-0793	Wecota Annex 405

Course Description

This course is an advanced course on Geographic Information Systems (GIS) and introduces various GIS modeling techniques. Topics include weighted suitability modeling, path finding, modeling viewsheds, constructing surfaces from point samples, and spatial hydrologic modeling, etc. Meanwhile, this course also aims to help students develop advanced ArcGIS skills.

Course Prerequisites

GEOG 372 Introduction to GIS or equivalent course/experience.

Instructional Methods

Lecture, discussion, demonstrations, lab assignments, final project, oral presentation.

Course Schedule

Date	Topic	Readings	Lab
8/20	Course Overview	Syllabus; Chang Ch. 1	Lab Introduction
8/27	Introduction to GIS Modeling	Chang Ch. 2, 9, 18	Lab 1
9/3	**Labor Day Holiday (no class)**	Chang Ch. 5 Bolstad Ch. 7 (check D2L)	Literature Review & Learn EndNote
9/10	Vector Data Analysis	Chang Ch. 3, 11	Lab 2
9/17	Raster Data Analysis	Chang Ch. 4, 12	Lab 3
9/24	Distance & Least-Cost Path Analysis	Chang Ch. 17, p. 372-381	Lab 4
10/1	Guest Lecture (Dr. Liang Liang)	TBA	ESRI Training (TBA)
10/8	**Native American Day (no class)**	TBA	Prepare Proposal
10/15	Network Analysis	Chang Ch. 17, p. 381-387	Lab 5
10/22	Terrain Mapping & Analysis	Chang Ch. 13	Lab 6
10/29	Viewshed Analysis	Chang Ch. 14, p. 297-303	ESRI Training (TBA)
11/5	Watershed Analysis	Chang Ch. 14, p. 303-313	Lab 7
11/12	**Veterans' Day Holiday (no class)**	TBA	ESRI Training (TBA)
11/19	Spatial Interpolation	Chang Ch. 15 Bolstad Ch. 12	Lab 8
11/26	Project Advising & Support	Longley Ch. 16	Project Time
12/3	Final Project Oral Presentation		
12/5	Final Paper Due on 12/5 @ 5 pm		
12/6	Final Exam	Thursday, 1:45 – 3:45 PM @ Wecota Hall 0002	

This schedule is subject to change. Students will be notified of any changes.

The To-Do List for Each Week

1. Do the readings BEFORE you come to the lecture.

2. Attend the lecture on time and stay focused in class.

3. Review the points covered in the lecture after class (check D2L for the lecture slides).

4. Attend the labs on time and complete both demos (or online training) and assignments.

5. Continue to complete unfinished lab assignments and submit them before the deadline. (Assignments should be submitted electronically in D2L).

6. Feel free to ask me or your TA if you have any questions (during office hours or by appointment).

Lastly, there will be some other assignments in D2L from time to time. Please always check D2L for updates.

Course Requirements

Required Text

Chang, K.T. (2015). *Introduction to Geographic Information Systems* (8th edition). McGraw-Hill Education (ISBN: 978-0078095139)

De Smith, M. J., Goodchild, M. F., & Longley, P. (2018). Geospatial analysis: a comprehensive guide to principles, techniques and software tools. Troubador Publishing Ltd. (free online at http://www.spatialanalysisonline.com)

Other Readings

Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic information science and systems* (4th edition). John Wiley & Sons (ISBN: 978-1118676950)

Burrough, P. A., McDonnell, R., McDonnell, R. A., & Lloyd, C. D. (2015). *Principles of Geographical Information Systems* (3rd edition). New York: Oxford University Press. (ISBN: 978-0198742845)

DeMers, M. N. (2009). *Fundamentals of Geographic Information Systems* (4th edition). New York, N.Y.: John Wiley & Sons. (ISBN: 978-0470129067)

Jensen, J. R., & Jensen, R. R. (2013). *Introductory geographic information system*s. Pearson Higher Ed. (ISBN: 978-0136147763)

Railsback, S. F., & Grimm, V. (2011). *Agent-based and individual-based modeling: a practical introduction.* Princeton University Press. (ISBN: 978-0691136745)

Heppenstall, A. J., Crooks, A. T., See, L. M., & Batty, M. (Eds.). (2011). *Agent-based models of geographical systems*. Springer Science & Business Media.

Flake, G. W. (1998). *The computational beauty of nature: Computer explorations of fractals, chaos, complex systems, and adaptation*. MIT press.

Other readings may also be assigned and will be provided accordingly.

Lab Materials

Students will also need (at least) an 8 GB Flash Drive to store their lab and final project materials. All the data on the lab computers will be automatically wiped out when the computers are rebooted. SAVE YOUR FILES!!!

Attendance Policy

Attendance and full participation in classes is expected of all students. Attendance will be checked periodically. The class participation credit is given based on class attendance and/or in-class/take-home exercises. If you do not show up, 5 points will be deducted each time.

Make-up Policy

If a student misses an exam, points can only be made up if the student has an excused absence. To be considered an excused absence, the student must contact the instructor with a legitimate excuse prior to the day of the exam.

Classroom Policies

- All cell phones need to be turned off during the class/lab.
- No recording (photos, audio, etc.) without permission.

- Using computers/smartphones to surf the internet or work on other tasks is not allowed.
- If a laptop is used to take lecture notes, please sit in the back of the classroom.

Important Dates:

- August 20, Monday   First day of class
- August 30, Thursday   Last day to drop or add and adjust final fees
- August 31, Friday   "W" grad begins
- September 3, Monday   Labor Day Holiday
- October 8, Monday   Native American Day Holiday
- October 12, Friday   First Half Fall Term ends
- October 17, Wednesday   Deficiency reports due on WebAdvisor by midnight
- November 2, Friday   Last day to drop a course
- **November 11, Sunday**   Final Project Proposal Due
- November 12, Monday   Veterans' Day Holiday Observed
- November 21-25, Wed. – Sun.   Thanksgiving Recess
- **December 5, Wednesday**   Final paper due
- December 5, Wednesday   No classes; Final Exam Preparation
- December 6-12*, Thu. – Wed.   Final Exams
- December 17, Monday   Grades due on WebAdvisor by midnight

Overall Course Goals

Upon completion of this course, students will be able to:

1. Recall the fundamental concepts and principles of important GIS modeling methods.
2. Understand the procedures in GIS modeling.
3. Understand relevant modeling functionalities in ArcGIS.
4. Apply GIS to design a model to solve real-world problems.
5. Use ArcGIS to implement a GIS model.

Student Learning Outcomes

Knowledge Outcomes

Students will master the popular models in GIS and learn how to use GIS to design and implement a model to solve real-world problems. Moreover, students will also learn the current literature and resources in GIS modeling.

Skills Outcomes

Students will **develop specific skills and competencies in GIS** and **learn to use relevant GIS models to solve real-world problems**. Students will develop and complete a GIS-based research project. Other skill outcomes include: written communication, interpersonal communication, professional presentation, teamwork, and planning and organization.

Grade Evaluation

Evaluation Components	Points (each)	Points	Percent Value
Participation	TBD	100	10%
Lab Assignments (8)	50	400	40%
Final Exam	200	200	20%
Proposal	50	50	5%
Final Project Presentation	50	50	5%
Final Project Paper	200	200	20%
Total		1000	100%

Course Grade Scale

Grade	Final weighted points
A	90-100
B	80-89
C	70-79
D	60-69
F	< 60

Weekly Lab Exercises: All lab exercises will use ESRI's ArcGIS software to reinforce the concepts covered in the lectures. Although class time has been allocated for lab instruction and assignments, additional work will be necessary for the successful completion of the course. Each lab assignment will be available following the demonstration every week. Lab assignments must be submitted through the Dropbox on D2L. Points will be deducted each day for late submissions (Please check the lab syllabus for more details).

Exam: This course has a final exam. The exam will include multiple choice questions, short answer questions, and long answer questions. The questions come from the key points covered in the lecture, and a study guide will be given before the exam.

Final Project: The students are expected to use GIS modeling to accomplish a final project. The project should identify a spatial problem and solve the problem by developing a GIS model. The project must be original research work, and it cannot be as simple mapmaking using GIS software. Thus, the students are STRONGLY encouraged to discuss with the instructor regarding project ideas as early as possible. Undergraduate students can work on the project by themselves or in groups of two. Graduate students need to do the project on their own. I encourage all graduate students to associate the final project with your thesis topic. The project should consist of geographic question(s), background information, data selection, method/analysis, results, and conclusion.

Specifically, the final project should include the following components:

1. A project proposal that includes proposed research questions, background information (literature review), data sources, proposed methods, and expected results. (word count (not including references): 2,000-3,000 (graduate); 1000-2000 (undergraduate)).
2. A PowerPoint presentation (about 15 minutes) that summarizes the important steps in implementing the GIS-based analysis/model and the results.
3. A research paper (the main text within 25 pages (not including references) that consists of an abstract, introduction, literature review, methodology, results, discussion, and conclusion; word count: 2,500~3,500 (undergraduate), 3,000~4,000 (graduate); for graduate students in GEOG 574: The paper should be a high quality research paper and stick to the APA format).

More details on each component will be provided during the semester. Please refer to the course calendar and D2L for specific due dates.

Class Participation: The course requires a regular attendance in BOTH lectures and labs. Student participation in class discussion and intellectual interaction are encouraged. I will check attendance periodically. The class participation credit is given based on class attendance and in-class/take home exercises/quizzes.

Lab Section

The lab section is designed to help students gain hands-on experience in ArcGIS. There will be a number of weekly assignments for the students to enhance their modeling skills. Upon the completion of these specially designed labs, the students will work on a final project to demonstrate their competency in using GIS modeling to solve problems. Please note:

- Attendance to all of the labs is required.
- The weekly lab assignments need to be completed and submitted on time; penalty will be applied for the late submissions (Please refer to the lab syllabus for more details).
- NEVER try to skip a lab or leave one unfinished before starting another one - the technical skills required for a latter lab are often based on previous ones.
- NEVER be too shy to ask. Feel free to ask me or your lab instructor if you have any questions.
- Memorize all the commands, the procedures, and the solutions you used to solve each of the problems or generate each of the maps.

ADA Statement:

Any student who feels s/he may need an accommodation based on the impact of a disability should contact Nancy Hartenhoff-Crooks (or successor) 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 at the University Student Union.

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, Dean, or both, of the 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.