

## Advanced Geographic Information Science

Geography 419

MW 3:00 – 4:15 pm

T 1:00 – 2:40

Dr. Arthur J. Lembo, Jr.

Office Hours:

HS 157H MWF 8:00 – 10:00 am,

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**Textbook:** [Modeling our world](#), other individual readings provided by Professor.

**Purpose:** *This is both a techniques and a research class.* The purpose of this course is to further students' knowledge regarding geographic information science (GIScience) and geographic information systems (GIS). It is assumed the student has mastered the principles of GIS as well as having some experience in statistics and computer programming. The use of GIS for the mapping and analysis of spatial phenomena has never been more prevalent. This widespread utilization has increased the demand for basic GIS users as well as people who understand the advanced intricacies of spatial data handling. This course will provide that understanding by providing instruction on complex data issues, sophisticated spatial modeling procedures, and potential system pitfalls. Upon the completion of this course, the student will be prepared to utilize GIS at an advanced level, either in a vocational or educational setting.

**Attendance:** "The faculty regards the classroom as the center of University life and students are expected to attend all classes (*SU Undergraduate Catalog*, pg. 73)." However, attendance will not be taken regularly – nonetheless, the instructor ordinarily knows everyone by the second week, so your absence will be noted. A significant portion of the exams will be derived from class lectures and laboratory exercises make up a large portion of one's final grade. Thus, it is to the student's advantage to attend.

**Grading:** Grading will be based upon the student's performance on two examinations, laboratory exercises, laboratory logs, a term project and the student's level of professionalism. The grading scale will be the standard 90%=A, 80%=B system for each component. Modification to raw exam grades will occur to correct for instrument bias. No modifications or "curve" will be made to final grades.

**Exams:** A total of three exams will be given: one mid-term lab exam, one mid-term lecture exam and one final lecture exam at the end of the semester. The lecture exams will be comprised of short answer and essay questions and are cumulative. The lab exam will be designed to test technical skills using ArcGIS 10.2 software. The exams will occur according to the schedule included with this syllabus unless otherwise noted. Students that are unable to take the exam at the scheduled time should contact me at least one week ahead of time. Unscheduled make-up exams will only be given in extreme circumstances.

**Laboratory Exercises:** Eight laboratory exercises will be conducted throughout the semester. Each lab will consist of two parts. The first part will be completed in-class on Thursday. The second part of each lab will be assigned during that lab section and will ask each student to apply what he/she has learned during the tutorial. This second part may be started during the Thursday lab section but will be completed outside of official lab time. Each lab will have specific tasks that must be accomplished and questions that must be answered. Most labs are due at the beginning of class on the next Tuesday following their assignment – you should work on lab during the lab period, and directly afterwards. **I will not provide assistance the day before the lab is due, except under special circumstances.** Some labs may be group exercises.

In addition to the laboratory exercises, there will be 5 reading assignments where the student will read a scholarly essay and write a one paragraph summary of the article in addition to two questions about the article (for example, if you could ask two follow up questions from the author, what would it be). **All labs should be uploaded into Canvas as a .pdf, and all summary articles should be entered into Canvas as online text.**

**Laboratory Logs:** The practice of geographic information systems is a science; experiments are devised, data collected, results generated, and conclusions made. Any scientific study requires that detailed notes be kept to insure the repeatability of the experiment. As more GIS studies are used to bolster legal arguments, the necessity of knowing exactly how a study took place increases in importance. Therefore, students will be required to keep a log of all laboratory exercises. The grades assigned for the lab log will be separate and distinct from the lab grades themselves. Students will be given a score of 0 to 10 based on completeness, neatness, and repeatability potential. Logs will not be examined every week. Each student's log will be examined randomly at least three times during the semester.

**Final GIS Project:** The student will complete a GIS research project for submission to the [Chesapeake Studies conference](#) in June 2019. The research project may be an individual or group project and will entail

taking a concept through the data collection, manipulation, analysis, and representation process crucial to using GIS. Students will present their results at the Salisbury University Student Research Conference (SUSRC), and for those around in the summer, the Chesapeake Studies conference in June. More details will be given later.

***Students will submit an Intent to Submit for the Salisbury University Research Conference, while selected students will actually present their work at the conference.***

Breakdown of Grade Weights:

Mid-term Lab Exam	7%
Mid-term Lecture Exam	8%
Final Lecture Exam	15%
Lab Exercises/Questions	30%
Lab Logs/Summary papers	5%
Final Project	25%
Participation	10%

***Classroom Environment: Students are expected to contribute to an environment appropriate for learning that considers and respects the needs and rights of others. Any academic misconduct will be confronted and handled accordingly – this is especially true of this year, as we intend for our work to be shown at a professional conference. There will be zero tolerance of immature and unprofessional behavior. Please silence all electronic devices while in class. Do not arrive late and do not leave early – the door will be closed at 3:15.***

***Academic Integrity: Cheating, plagiarism and other forms of academic dishonesty will not be tolerated in this course. Students should pay special attention to the expectations discussed in the 2005-2006 Student Handbook and 2005-2007 University Catalog. Violating these rules will result in significant grade penalties up to and including a failing grade for the course. Extreme cases of academic misconduct can result in expulsion from the University.***

***Writing Across the Curriculum: All writing assignments, both formal and informal, are in support of Salisbury University's Writing Across the Curriculum Program.***

***Important University Dates for Fall***

***Last day to drop/add – February 1***

***Last day to withdraw from course to receive a "W" – April 5***

***Changes to Syllabus: This syllabus may be modified or changed by the instructor as necessary. Students will be notified of the changes in class.***

*Lecture Schedule*

<b>Date</b>	<b>Topic</b>	<b>Lab (Tuesday)</b>	<b>Readings</b>
Monday, January 28, 2019	<a href="#">Syllabus discussion and overview</a> , <a href="#">GIS data representations</a> , <a href="#">The structure of GIS</a>		Chapter 3 (Zeiler)
Wednesday, January 30, 2019	<b>Geographic data models</b>	<b>Lab 1:</b> Review of ArcGIS Basics – The Nature Conservancy Habitat Model	<b>Summary paper 1:</b> <a href="#">Dangermond article</a>
Monday, February 04, 2019	<b>Vector GIS Functions</b>		<b>Summary paper 2:</b> <a href="#">Cartographic Modeling</a>
Wednesday, February 06, 2019	<b>Cartographic Modeling</b>	<b>Lab 2:</b> Getting Real-World Data into GIS	Chapter 9 (Zeiler)
Monday, February 11, 2019	<b>Raster GIS</b>		<b>Summary paper 3:</b> <a href="#">Anaerobic digester site analysis.</a>
Wednesday, February 13, 2019	<b>Cell-based Modeling with Rasters (Six Mile Creek Watershed example)</b>	<b>Lab 3:</b> Cartographic Modeling – The Nature Conservancy revisited	
Monday, February 18, 2019	<b>Creating Watersheds with Raster</b> - are you smarter than Dr. Z?		<b>Summary paper 4:</b> <a href="#">Terrain modeling</a>
Wednesday, February 20, 2019	<b>Linear Modeling with Networks</b> Practical considerations for networking	<b>Lab 4:</b> Raster modeling with the Cubby Bear	
Monday, February 25, 2019	<b>Linear Modeling in ArcGIS</b>		Chapter 8 (Zeiler) <b>Summary paper 5:</b> <a href="#">Network Analysis</a>

Wednesday, February 27, 2019	<b>Spatial interpolation</b> (Kriging)	<b>Lab 5:</b> Network Analysis – bank robberies; Buffalo Wing market penetration	<a href="#">ESRI Help Manual</a>
Monday, March 04, 2019	<b>Spatial interpolation</b> (Kriging) – elevation examples		Chapters 13,14 and 15 (Lembo)
Wednesday, March 06, 2019	<b>Advanced Spatial Analysis</b> (identify spatial patterns)	<b>Lab 6:</b> Spatial Statistics	Chapters 13,14 and 15 (Lembo)
Monday, March 11, 2019	<b>Breaking down big data problems</b>		
Wednesday, March 13, 2019	<b>Proposal Discussion – what does a research report look like</b>	<b>Lab Practicum</b>	<a href="#">Intent to Submit - SUSRC</a>
Monday, March 18, 2019	<b>SPRING BREAK</b>		
Wednesday, March 20, 2019	<b>SPRING BREAK</b>		
Monday, March 25, 2019	Final Project discussion		<b>Summary paper 6:</b> <a href="#">Chambers article</a>
Wednesday, March 27, 2019	<b>Mid-Term Exam</b>		
Monday, April 01, 2019	Final Project		<a href="#">Abstracts Due - SUSRC – April 1</a>
Wednesday, April 03, 2019	Final Project	Final Project	
Monday, April 08, 2019	Final Project		
Wednesday, April 10, 2019	Final Project	Final Project	
Monday, April 15, 2019	<b>Geodatabases</b>		Chapter 12 (Zeiler)

Wednesday, April 17, 2019	<b>Making features smart</b>	<del>Lab Practicum</del>	Chapter 5 (Zeiler)
Monday, April 22, 2019	Geodatabase (object modeling)		
Wednesday, April 24, 2019	Geodatabase (making features smart)	Canned geodatabase (on Tues/Wed)	
<b>SUSRC April 26</b>			
Monday, April 29, 2019	Coordinate Math		
Wednesday, May 01, 2019	<b>**** Lecture Exam ****</b> Spatial algorithms	Work on geodatabase design	
Monday, May 06, 2019	a little bit of Arcpy...		
Wednesday, May 08, 2019	<b>Course review</b>	<b>Geodatabase project</b>	
Monday, May 12 2019	<b>Fine tune posters for summer conference</b>		
Tuesday, May 14, 2019		<b>Database Design Presentations (1:00 – 3:00 pm)</b>	
<b>Final Exam – Tuesday, May 21 1:30PM</b>			

\*\*\*Both schedules are **very** tentative.

Supplemental readings will be announced one week before scheduled lecture.