GEOG 435/535 – GIS Programming

Instructor: Dr. Arthur J. Lembo, Jr.
Office: Henson Hall 157H
Office Hours: M,W 9:00-11:00am; (also by appointment)
Phone: 410-677-0140
E-mail: ajlembo@salisbury.edu
Class Meetings: MW 3 – 4:15 p.m. Henson Hall 153

Course Description: This course will introduce the basics of programming and its applications in geographic research. This will focus primarily on writing SQL statements and python programs with **both commercial and open source GIS**. After finishing this class, students are expected to be able to write their own programs to automate geographic tasks.

Text: We will be using a combination of .pdf files and video lectures. ALL students must have access to headphones, and bring them to class as we will have numerous video exercises to work through in class. The reasons for the video exercises are due to a much more rapid pace of learning.

Grading: This course has a total of 8 quizzes, and numerous work projects during the semester, in addition to a final programming project. Each quiz is worth 5 points, each work project is worth 5 points, the final project is worth 25 points, and class participation is worth 10 points (a total of **100 points**). Failure to complete an assignment will cause a deduction in your class participation grade.

Some of your assignments will be from the ESRI Virtual Campus - DO NOT PURCHASE THE COURSES - our license with ESRI allows free use for students. Your Professor will give you the access codes.

Note: graduate students will be required to complete a separate research project that accounts for 10 percent of their final grade. Therefore, the final project for graduate students is 15 points, and the supplemental research project is 10 points. The supplemental research project will relate to topics such as evaluating the relative speeds of different GIS algorithms or hardware configurations, or might be comparing the algorithmic intensity of two different commercial software packages.

Special note on projects: This year student projects will be a little different. In the past we have given poster presentations and even presented our work in a

GoTo Meeting to the ESRI development staff in Redlands, CA. This year, our class will *give back* to the GIS community by creating four separate projects that we will donate to the GIS community, each headed by a lead developer. There will be more information on this during the semester.

Expectations and Responsibilities: Students are expected to have a basic knowledge of computer systems and data processing methods using both Windows and command line operations similar to that found in older DOS-based programs. Students should be able to communicate with the instructor using electronic mail, and to access and search the Internet for data and information relevant to the course. A working knowledge of Word, Excel, and Powerpoint is helpful.

A major responsibility of the instructors is to promote an active learning environment in the course which requires instructors and students to be motivated, participatory, and communicative. Lecture assignments, quizzes, and exams are designed to be conducted independently. Instructors and students are expected to adhere to Salisbury University's code of academic integrity.

Students with special needs: Students with special needs (i.e. untimed tests, etc.) must contact the Vice President of Student Affairs (3-6082) for the appropriate documentation. For students who need special arrangements for taking exams, *you must bring me a letter at least 1 week before the first exam.*

Attendance: Attending class is important. Coming to class, paying attention and taking notes is the best way to learn the course material. Most lectures will come from the lecture notes and will only be presented in class. If I sense that you are not coming to class, I will purposefully assign quizzes or projects during those class times and you will not receive points for those activities, and your class participation grade will suffer as well.

This course will be both in-person, and online. Monday will always be a lecture, and many Wednesdays will be for students to work online – I will let you know when we don't have an official lecture on Wednesday. When not lecturing on a Wednesday, I will still be here, working on interesting things, and being available to help you with any difficulties you may encounter. I'll probably be writing some SQL and Python to perform distributed processing on Wednesday, so if you come to the class, you can help me slog through some of this stuff.

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. Please silence all electronic devices while in class. **Do not arrive late and do not leave early**.

******** **PLEASE NOTE SCHOOL POLICY FOR THE H1N1 VIRUS** **********

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 Spring
Last day to drop/add – August 30
Last day to withdraw from course to receive a "W" – October 25

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

FINAL EXAM: FRIDAY DECEMBER 13.
1:30 – 4:00pm (Don't shoot the messenger).

Date	Topic	Assignment
Monday, August 26, 2019	Course Introduction, examples of programming in GIS, getting accounts set up, getting up to speed with Postgres.	
Wednesday, August 28, 2019	Nature Conservancy overview Get spun up on QGIS, Postgres, and PostGIS Sign on to Udemy account GIS lifecycle, spatial concepts in indexing, parallel processing, and field experiences. Spatial SQL: A language for Geographers	

Monday, September 02, 2019	No Class – Labor Day	
Wednesday, September 04, 2019	**Spatial SQL: A Language for Geographers** – Sections I, II, and III	
Monday, September 9, 2019	**Spatial SQL: A Language for Geographers** – Section IV	
Wednesday, September 11, 2019	**Spatial SQL: A Language for Geographers** – Section V **SQL Practice**	*online*
Monday, September 16, 2019	**Quiz #1: Traditional SQL queries** **Class discussion – *Denton work project***	
Wednesday, September 18, 2019	**Spatial SQL: A Language for Geographers** – Section VI **Prepare for Spatial SQL quiz** **Market Analysis with SQL**	*online*
Monday, September 23, 2019	**Spatial SQL: A Language for Geographers** – Section VII, Python and SQL – Distance decay application, big data query with indexes. **Quiz 2, In class**	*In class*
Wednesday, September 25, 2019	**Homework – *optimizing queries*** **Out of class quiz #3: Spatial SQL Statements**	*online*
Monday, September 30, 2019	**Quiz #4:** Richland Chemical in SQL	*In class*
Wednesday, October 02, 2019	***ARC/INFO functions in SQL***	*online*
Monday, October 07, 2019	**Quiz #5: Crisfield Emergency**	https://pypi.python.org/pypi/geocoder#downloads
Wednesday, October 9, 2019	National Folk Festival data analysis Class discussion – *Huff Model for Retail Gravitation in SQL*	*Online*
Monday,	**Python Setup:** quick overview, demonstrations (Google,	

October 14, 2019	Psycopg2), and loading the packages.	
Wednesday, October 16, 2019	Videos - A gentle overview of Python *Lembo away*	*Online* **Section I** Read student paper
Monday, October 21, 2019	Introduction to Arcpy Class discussion – *python examples directory*	Online resource: Section III ESRI Virtual Campus: Basics of Python (for ArcGIS 10)
Wednesday, October 23, 2019	In class – more Arcpy intro (start the Richland work, creating a tool) Videos – External Modules, Explicitly Spatial Modules	ESRI Virtual Campus: Python Scripting for Map Automation in ArcGIS 10
Monday, October 28, 2019	**Quiz #6: Richland Chemical in Arcpy** Bivariate maps with Python	ESRI Virtual Campus: Python Scripting forGeoprocessingWorkflows (for ArcGIS 10)
Wednesday, October 30, 2019	**Lembo away – see assignment** **Group assignment** – Wishy Washy Lab from GEOG 319 Solutions with Arcpy and Postgres with psycopg2 Team 1: Austin, Ashley, Nick, Hannah Team 2: Roger, Adam, Michaella, Charles	*Online* Postgres and Excel Section II
Monday, November 04, 2019	Integrating psycopg2 to automate Postgres queries Near my home	
Wednesday, November 06, 2019	Present Wishy Washy Solution	*In class* Section IV
Monday, November 11, 2019	Homework: Denton spatial (with Arcpy)	
Wednesday, November 13, 2019	Class Project discussion	*In class*
Monday, November 18, 2019	**Class project - Introduction**	

Monday, November 25, 2019	**Class project - algorithm**	
Monday, November 27, 2019	**Thanksgiving – no class**	
Monday, December 02, 2019	**Class project – completed code**	
Wednesday, December 04, 2019	**Class project – polished up code with form**	