GGS 553-001 (3 credits)
Geographic Information Systems
Spring, 2020, T 4:30 – 7:10pm, 2103 Exploratory Hall
David Wong, Professor
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Office Hours: Tuesday 3-4pm, Wednesday 12:30 -1:30pm, or by appointment

COURSE DESCRIPTION

University Catalog:" sources of digital geospatial data; and methods of input, storage, display, and processing of spatial data for geographic analysis using GIS. Lectures, hands-on exercises familiarize students with current technology."

This course introduces fundamental scientific principles, theories, and techniques in the design and use of geographic information systems. Students will learn how the physical features, events, and phenomena are encoded and stored, and how the system can be used to answer geographic questions through the use of analytical procedures supported by the data.

Recommended Prerequisite: GGS 550 or equivalent, or permission of instructor.

LEARNING OUTCOMES

By the end of this course, students will:

1. Be exposed to selected basic and fundamental *concepts, terms, principles and techniques* associated with Geographic Information Systems and Science (you are far from an "expert" in GISs).
2. Be familiar with the format and structure of spatial data used in popular GIS, and be able to perform basic functions in GIS to process and manipulate the spatial data (we will not discuss how to execute specific GIS functions in a system in class).
3. Have acquired hands-on skills and knowledge through tutorials and exercises (expect to experience some glitches in the exercises and you will only learn a limited number of GIS processes and functions).
4. Be aware of some limitations and caveats of using GIS and maps, and develop critical spatial thinking (you may not be able to provide answers to most of the questions yet).

TECHNOLOGY REQUIREMENTS

General Hardware:

ArcGIS Pro, the adopted system for this course, works best in Windows. If you have a Mac, you MAY install and run ArcGIS Pro if you use Boot Camp or have Virtual Windows installed. However, we have limited knowledge to provide technical support in such an environment.

Software:

Each student will be given a "license" of ArcGIS Pro to be installed on his/her own computer in order to complete the labs. Instruction for installation will be given on Blackboard. ArcGIS Pro is also installed on computers in departmental classrooms and labs. Be aware that different versions of ArcGIS Pro may be available to students for personal use and in the lab/classroom.

TEXT (required)
Bolstad, P. 2019. *GIS Fundamentals: A First Text on Geographic Information Systems*. 6th edition. XanEdu. ISBN: 978-1-59399-552-2. You may order the book through the web: https://www.xanedu.com/higher-education/educators/custom-books-catalog/gis_fundamentals_6e/).

ASSESSMENTS
In order to achieve the learning outcomes, you are expected to read the relevant sections of the textbooks, attend and engage in the course lectures, and complete the GIS tutorials and lab exercises. Your comprehension of the knowledge will be evaluated through various means described below.

a. Lessons/Labs (in total, 60% of course grade; not equally distributed across exercises): You are expected to complete 10 separate GIS labs (downloaded from Blackboard. They are based on Bolstad's labs but are tailored for this class). Late submissions will be penalized 5% for each day, and will not be graded after two weeks. Cartographic work must be submitted in the highest quality and according to standard cartographic conventions. Specifics of labs and their due days will be posted on Blackboard.

b. Written Examinations (30%): There will be 2 in-class timed tests and the final exam with 10% each. These examinations will be based on materials covered in the lectures. The exams will include multiple choice questions, definitions, and short answer questions.

c. Practical Examination (10%): Each student will complete a list of specific tasks within a prescribed period in class during the final week of the semester. This exam tests student's comprehension of the GIS in handling, processing and analyzing spatial data.

Grades are assigned in a "sliding" scale ("curved"). Students with the highest scores will receive an A. Average scores will be assigned to A- or B+. Scores "significantly" lower than the rest of the class will be assigned to a failing grade.

Incomplete will be handled strictly according to the University policy. Make-up tests are not given unless under unusual circumstances such as serious illness. Proof (documentation) is necessary to be eligible for make-up tests.

UNIVERSITY POLICIES

Academic integrity: Please aware and adhere to university policies related to academic integrity, honor code and the responsible use of computing, etc.
http://masononline.gmu.edu/student-resources/academicintegrity/

* Email communication: Mason uses only Mason e-mail accounts to communicate with enrolled students. Students must activate their Mason e-mail account, use it to communicate with their department and other administrative units, and check it regularly for important university information including messages related to this class.

Students with disabilities: If you are a student with a disability and you need academic accommodations, please see me and contact Disability Services at 703.993.2474 or ods.gmu.edu. All academic accommodations must be arranged through that office.

Add/Drop deadlines: please aware of the standard add/drop deadlines.

TENTATIVE COURSE SCHEDULE (subject to change)
You are responsible for keeping up with the textbook readings, lectures, GIS labs, and assessments.

WEEK		*TOPICS*	*TEXT & LABS*	*DUE & TESTS*
Section I: Basics				
1	Jan 21	Course Overview and What is GIS?	Ch 1: An Introduction to GIS Lab 1: Introduction to ArcGIS Pro	Install ArcGIS Pro
2	Jan 28	Reference to a location	Ch 2: Data Models (coordinate data) Ch 3: Geodesy and Map Projections Lab 2: Projecting Geographic Data	
3	Feb 4	Represent the Earth	Ch 2: Data Models	Lab 1
4	Feb 11	Represent the Earth	Ch 2: Data Models	Lab 2
Section II: Spatial Data				
5	Feb 18	Spatial data input and presentation	Ch 4: Maps, Data Entry, Editing, and Output Lab 3: Digitizing in ArcGIS Pro	Test #1 (up to Week 4)
6	Feb 25	Spatial data capture	Ch 5: Global Navigation Satellite Systems (skip surveying) Ch 6: Aerial and Satellite Images	
7	March 3	Other spatial data and data utilization issues	Ch 7: Digital Data Ch 14: Data Standards and Quality Ch 4: Metadata Lab 4: Digital data	Lab 3
Section III: Spatial Data Management & Analysis				
8	March 10	Spatial data storage and management	Ch 8: Tables Lab 5: Table 1; Lab 6: Table 2	Lab 4
9	March 17	No class – Spring Break		
10	March 24	Vector data analysis	Ch 9: Basic Spatial Analysis Lab 7: Buffering and overlay	Test #2 (up to Week 8)
11	March 31	Raster data analysis	Ch 10: Topics in Raster Analysis Lab 8: Raster Analysis	Labs 5 & 6
12	April 7	2.5D data analysis	Ch 11: Terrain Analysis Lab 9: Terrain Analysis	Lab 7

13	April 14	No class – AAG Annual Meeting (Denver)		Lab 8
14	April 21	Model building in GIS	Ch 13: Spatial Models and Modeling Lab 10: Cartographic Modeling	Lab 9
15	April 28	"Future" of GIS	Ch 15: New Developments in GIS	
16	May 5	Reading Day		Lab 10
17	May 12	Final exam		