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GGS 553 Geographic Information Systems
Spring, 2021
Online live session: Mondays 5:55 – 7:10 pm
David Wong, Professor

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Virtual Office: https://gmu.webex.com/meet/dwong2
Blackboard (Bb): https://mymasonportal.gmu.edu/

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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 will be 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 spatial data (we will not discuss how to execute specific GIS functions of 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).

FORMAT AND LOGISTICS

This course is an online course with learning activities scheduled for each week. Most of the learning activities (90% or more) are conducted in your own. Detailed schedule for specific learning activities are posted on Blackboard (Bb). Lecture notes and videos are posted on Bb. Students should review them according to the class schedule.

Students are responsible for keeping up with the textbook readings, lectures, GIS labs, and assessments.

The course meets once a week online on Mondays, 5:55 – 7:10 pm. The online synchronous sessions will
o   address logistical and course-content questions;
o   review, comment, clarify lecture material.
Attending these live sessions are not required, but are strongly encouraged. Tips of exams will be offered.

TECHNOLOGY REQUIREMENTS

General technology requirements:
Please refer to the Mason's general technology requirements for online learning.
https://masononline.gmu.edu/what-technologies-do-i-need/

Course specific:
The weekly synchronous session will use Blackboard Collaborate Ultra. In the event that Bb Collaborate Ultra is inaccessible for the synchronous session, we will switch to Zoom.
https://gmu.zoom.us/j/98939007921
You will need a "decent" computer to complete the required exercises and exam for this course. Students can use the GIS program, *ArcGIS Pro* (*ArcPro*) either by installing the program on your computer or via a virtual student computing lab. Students can also access the program through the computer labs on campus. If you choose to install *ArcPro* on your own computer, it will require administrator-level access and control of a Windows PC computer (see Bb for details). If you choose to access *ArcPro* via the Citrix Virtual Lab, *VPN* installation and access will be required. Details are also provided on Bb.

Non-windows users:
Macs and Linux users should be aware that *ArcPro*, the main program used in this class runs on Windows only. You need to set up your Mac with Boot Camp or virtualization software so Windows will run on it (https://support.apple.com/en-us/HT201468). Also search "running windows on my Mac". Linux computers can also be configured with virtualization software or configured to dual boot with Windows.

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 University bookstore or on the publisher website: https://www.xanedu.com/higher-education/educators/custom-books-catalog/gis_fundamentals_6e/).
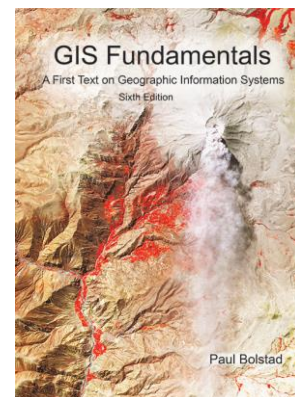
ASSESSMENTS

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

a. A Pre-class Self-Introduction and Survey (5% in total)

b. Lessons/Labs (in total, 55% of course grade; not equally distributed across exercises):
You are expected to complete 10 separate GIS labs (downloaded from Bb. 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 Bb.

c. Written Examinations (30%): There will be 2 timed tests and a 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.

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

- Distribution of the total final scores at the end of the course will be used to determine the final grades using a "sliding scale" (curved) (letter grades will not be given to individual labs and tests).
- Students with the highest total scores will receive an A. Average (mean) scores will be assigned to A- or B+. Scores "significantly" lower than the rest of the class will be assigned to a failing grade.
- All materials submitted to meet the evaluation criteria should be completed in accordance with the student Honor Code (University Catalog).

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. No early exams will be given.

TENTATIVE COURSE SCHEDULE (subject to change)

WEEK/ DATES	TOPICS	TEXT, LABS & ACTIONS	DUE & TESTS
	Pre-class action items	Self-introduction (Jan 23), Survey (Jan 24), & Install *Arc Pro* or VPN	*Dues are at the end of the day*
	Basics		
Week 1 1/25 - 29	Course Overview and What is GIS?	Ch 1: An Introduction to GIS Lab 1: Introduction to Arc Pro	
Week 2 2/1 - 5	Reference to a location	Ch 2: Coordinate Data Ch 3: Geodesy and Map Projections Lab 2: Projecting Geographic Data	1/31: Lab 1
Week 3 2/8 - 12	Represent the Earth	Ch 2: Data Models Install Respondus Lockdown Browser	2/7: Lab 2
Week 4 2/15 - 19		Catch-up and Review Test the Browser with the mock test	
	Data Management		
Week 5 2/22 - 26	Spatial data input and presentation	Ch 4: Maps, Data Entry, Editing, and Output Lab 3: Digitizing in ArcGIS Pro	2/22 (5:55 – 7:10 pm): Test #1 (up to Week 4)
Week 6 3/1 - 5	Spatial data capture	Ch 5: Global Navigation Satellite Systems (skip surveying) Ch 6: Aerial and Satellite Images	2/28: Lab 3 3/5: Submit your map
Week 7 3/8 - 12	Other spatial data and data utilization issues	Ch 7: Digital Data Ch 14: Data Standards and Quality Ch 4: Metadata Lab 4: Digital data	
Week 8 3/15 - 19	Spatial data storage and management	Ch 8: Tables Lab 5: Table 1; Lab 6: Table 2	3/14: Lab 4
Week 9 3/22 - 26		Catch-up and Review	**3/26**: Labs 5 & 6
	Analysis		
Week 10 3/29 - 4/2	Vector data analysis	Ch 9: Basic Spatial Analysis Lab 7: Buffering and overlay	3/29 (5:55 -7:10 pm): Test #2 (up to Week 9)
Week 11 4/5 - 9	Raster data analysis	Ch 10: Topics in Raster Analysis Lab 8: Raster Analysis	4/4: Lab 7
Week 12 4/12 - 16	2.5D analysis	Ch 11: Terrain Analysis Lab 9: Terrain Analysis	4/11: Lab 8
Week 13 4/19 - 23	Model building in GIS	Ch 13: Spatial Models and Modeling Lab 10: Cartographic Modeling	4/18: Lab 9
Week 14 4/26 - 30	"Future" of GIS	Ch 15: New Developments in GIS	4/26 (5:55 – 8:30 pm): Practical Test 4/30: Lab 10
5/3	Final exam		4:30 – 7:15 pm

Other Policies:

Academic Integrity: Mason is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Mason Diversity Policy:

Please refer to the university non-discrimination policy and diversity statement.
https://universitypolicy.gmu.edu/policies/non-discrimination-policy/
https://stearnscenter.gmu.edu/knowledge-center/general-teaching-resources/mason-diversity-statement/

Student Responsibilities:

Please refer to the university policies and expectations.
https://catalog.gmhttps://catalog.gmu.edu/archives/2017-2018/policies/student-rights-responsibilities/u.edu/archives/2017-2018/policies/student-rights-responsibilities/

GMU Email Accounts: Students must use their GMU email account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information.

Office of Disability Services: If you are a student with a disability and you need academic accommodations, please contact the Office of Disability Services (ODS) at 993-2474, http://ods.gmu.edu. All academic accommodations must be arranged through the ODS.

GMU Resources:

The Writing Center: http://writingcenter.gmu.edu
University Libraries, Ask a Librarian: http://library.gmu.edu/ask
Counseling and Psychological Services: http://caps.gmu.edu
University Catalog: http://catalog.gmu.edu
University Policies: http://universitypolicy.gmu.edu
Academic Calendar (drop/withdrawal deadlines): https://registrar.gmu.edu/calendars/

Course Materials and Student Privacy:

- All course materials posted to Blackboard or other course site are private; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.
- Video-recordings of class meetings that include audio or visual information from other students are private and must not be shared.
- Live Video Conference Meetings (e.g. Collaborate or Zoom) that include audio or visual information from other students must be viewed privately and not shared with others.
- Some/All of our synchronous meetings in this class will be recorded to provide necessary information for students in this class. Recordings will be stored on Blackboard [or other secure site] and will only be accessible to students taking this course during this semester.

*The instructor reserves the right to modify this syllabus, but will notify students about the change.