GEOGRAPHY & GEOINFORMATION SCIENCE 311
INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS

1. INSTRUCTOR & TA

Instructor: Dr. Matt Rice
Term: Spring 2021
Class-Section (CRN): GGS 311- DL1 (16220)
Modality: Primarily online asynchronous
Location: Online (Blackboard/Zoom)
Faculty Office Hours: Thursdays 3:00-4:30pm via Zoom
Instructor Email: rice@gmu.edu subject=[GGS 311]
Phone: (703) 957-9575
TA: *TBA*

Contact and Office Hours: I can be reached via email, phone, or zoom to arrange alternate office hours if needed. I may not be able to read and answer your email immediately, particularly on evenings or weekends, but I will do my best to be available, provide help, and answer questions quickly, usually within 24 hours. Students must activate and use their GMU campus email to facilitate contact. **I cannot communicate with you through a non-GMU email.** Please use a subject line prefix tag: [GGS 311]. **Send general GIS and troubleshooting questions to the TA first**. If the question or concern is administrative, contact me first.

2. COURSE DESCRIPTION

This course is designed as an introduction to geographic information systems and focuses on the associated fundamental scientific principles, theories, and techniques. Students will learn how the Earth's features are modeled and stored in a computer information system. Students will learn how to use geographic information systems to answer geographic questions and how to perform simple analytical procedures using geographic data. Students will formulate a research proposal around a scientific question, adopt appropriate GIS-based methodology, collect geographic data, conduct analysis, and prepare a summary and evaluation of findings.
Credit Hours for this course: 3

3. COURSE PREREQUISITES

There are no formal prerequisites. Some students may find GGS 110 (Maps and Mapping) very useful. In the future, it may be a prerequisite to this course.

4. COURSE EXPECTATIONS

1. Upper division online (distance education) courses require dedication and organization. Proper preparation is expected every week. You are expected to stay informed, review course material on a daily basis, and complete the assignments and activities on or before the due dates.
2. Students must check their GMU email messages on a daily basis for course announcements, which may include reminders, revisions, and updates.

3. It is expected that you will familiarize yourself with and adhere to the Honor Code. Student members of the George Mason University community pledge not to cheat, plagiarize, steal, and/or lie in matters related to academic work.
4. Students must complete work according to instructions, in the correct format, by the deadline.
5. It is essential to communicate any questions or problems to me promptly.

5. LEARNING COMMUNITY

This course is taught online through blackboard. Log into http://mymason.gmu.edu, select the Courses Tab, and the course can be found in the Course List.

This course is offered completely online. Each week begins on Monday morning and ends on Sunday at midnight. Student will be assisted through Blackboard Collaborate sessions where GIS software is demonstrated. **In order to participate in Blackboard Collaborate, you must be at a computer with a microphone** and optionally, a video camera.

In online interactions, we must be respectful of one another. Please be aware that innocent remarks can be easily misconstrued. Sarcasm and humor can be easily taken out of context. When communicating, please be positive and diplomatic.

6. LEARNING OUTCOMES

By the end of this course, students will be able to:
1. Demonstrate a broad knowledge-base of the fundamental scientific theories, principals and techniques of Geographic Information Systems.
2. Demonstrate an understanding of the societal context of GIS, and articulate important historical events, contemporary developments, and future trends that shape GIS.
3. Apply and demonstrate key concepts of spatial analysis using commercial GIS software.
4. Given a specific problem, identify problem parameters, characterize data needs, assemble data, and perform analysis with GIS.
5. Effectively communicate results of research and analysis using maps and graphics produced with GIS, created according to best professional cartographic practices and aesthetic guidelines.

7. TECHNOLOGY REQUIREMENTS & EXPECTATIONS

General Hardware:
To complete this class and use Blackboard effectively, you will need access to a Windows or Macintosh computer with at least 4 GB of RAM and to a fast and reliable broadband Internet connection (e.g., cable, DSL). A larger screen is recommended for better visibility of course material. You will need speakers or headphones to hear recorded content and a headset with a microphone is recommended for the best experience. For the amount of Hard Disk Space required to take a course such as this, consider and allow for: **1.** The storage amount needed to install any additional software and **2.** Space to store work that you will do for the course. If you are considering the purchase of a new computer, please go to http://patriottech.gmu.edu/ to see recommendations. Review general hardware requirements for ArcGIS Desktop and ArcGIS Pro, provided by Esri, the vendor of the GIS software we

use for this course. If you meet the requirements or come close to both, you will be fine to run ArcGIS Pro 2.5.2, and if not, you can use the Citrix Virtual Lab.

Software:

This course uses Blackboard as the learning management system. You will need a browser and operating system that are listed compatible or certified with the Blackboard version available on the myMason Portal. See supported browsers. Log in to myMason to access your registered courses. Some courses may use other learning management systems. Check the syllabus or contact the instructor for details. Online courses typically use Acrobat Reader, Java (Windows), and QuickTime. Your computer should be capable of running current versions of those applications. GMU Information Technology Services recommends that you protect your computer from viruses: https://its.gmu.edu/knowledge-base/does-mason-provide-antivirus-software/.

Students owning Macs or owning computer running Linux should be aware that some courses may use software that only runs on Windows, including the primary software tool for this class, ArcGIS Pro v.2.5. You can set up a Mac computer with Boot Camp or virtualization software so Windows will also run on it. This following webpage https://support.apple.com/en-us/HT201468) contains information about using Windows on a Mac in bootcamp mode. It is also possible to run Windows using a virtual machine on your Mac. Search "running windows on my Mac". Computers running Linux can also be configured with virtualization software or configured to dual boot with Windows.. Setting up Windows on your Mac can be a bit complicated, and will require some external technical support.

Note: If you are using an employer-provided computer or corporate office for class attendance, please verify with your systems administrators that you will be able to install the necessary applications and that system or corporate firewalls do not block access to any sites or media types.

GGS 311: Geographic Information Systems Software

PLEASE READ CAREFULLY: You will need to be able to use a computer to participate in this course and complete the required work. You will not be required to purchase GIS software, but will have a one-year student evaluation version of **ArcGIS Pro v.2.5** provided for you through a software download link. Although access to this GIS software is provided through computer labs on campus, you may choose to install and use the student GIS software on your own computer. This will require administrator-level access and control of a **Windows PC computer**. If you have convenient, frequent access to any computer with ESRI's ArcGIS Pro v.2.5 or v.2.6 installed and running, you may be able to use this computer for the GIS exercises and will not need to do the software install. GMU campus computer labs, including the Citrix Virtual Lab, will have ArcGIS Pro v.2.5 available.

8. TEXTS & MATERIALS (required)

Textbooks must be purchased and available prior to the first day of class. The textbook is widely available from a number of sources as a new book, as a used book, and as a rental. Both books are required. The first book (Longley et al., "Geographic Information Science and Systems", 4th edition) is a traditional textbook that will be used for lectures and exams. The second book (Price, "Mastering ArcGIS", 8th edition) is a GIS workbook with tutorials and exercises that will be due each week.
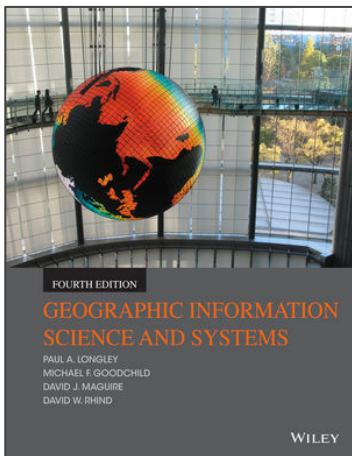
Geographic Information Science and Systems, 4th Edition

Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind
March 2015, ©2016
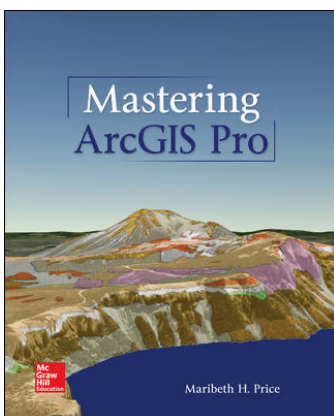**ISBN:** 978-1-119-03130-7
ISBN-13: 978-1118676950
ISBN-10: 1118676955

_____

Limited Chapter versions of this text book exist and may be used with caution. The limited chapter versions need to be the 4<u>th</u> edition with the following original chapter numbers: 1, 3, 4, 5, 6, 7, 8, 11, 12

Mastering ArcGIS Pro, 1st edition

By <u>Maribeth Price</u>

Copyright: 2020

Publication Date: January 18, 2019
ISBN10: 1260587339
ISBN13: 9781260587333

Note from Publisher on purchasing options: <u>https://www.mheducation.com/highered/product/mastering-arcgis-pro-price/M9781260587333.html</u>

Data Storage

Each student may find it useful have a USB flash drive or disk space to store around 2 Gb of data files that we will use for some of the computer exercises. Students using the Citrix Virtual Lab to use ArcGIS will need to use Microsoft OneDrive to store and sync class data files.

9. PERFORMANCE-BASED ASSESSMENTS

You will achieve the course learning outcomes **(Syllabus Section 6)** through reading the textbook, preparing and writing reading summaries (reading reflections), participating in online class discussions, working through GIS tutorials, completing lab exercises, and taking online assessment exams at midterm and during finals week.

a. Reading Reflections: Each student will prepare a bi-weekly 1-page (150-200 word) reading reflection based on the textbook material from Longley et al. (2015) and from the associated lectures. The reading reflections will be graded on both content and form, and collectively will be worth 10% of the final grade. See the Reading Reflection Grading Rubric below.

b. Class Discussions: Each student will participate in an Instructor and TA-led discussion, using the Blackboard discussion tools. The bi-weekly discussions will be based on current events from popular news sources, case studies and extra material from the textbook readings, or subjects chosen by the class.   Each student is required to participate during each discussion by making a contribution to the discussion, either with an individual post and with a thoughtful reply to a post. Opinions are not being graded but rather, quality of participation, as noted in the Rubric for Class Discussions. Participation in class discussions is worth 10% of the final grade, and will be assessed bi-weekly. See the Class Discussion Rubric below.

c. GIS Exercises: There will be 9 separate GIS tutorials and exercises from the Price textbook and Dr. Rice. The tutorials and exercises are assigned weekly as noted on the syllabus below. The GIS tutorials and exercises come from the Maribeth Price, "Mastering ArcGIS Pro" textbook, as well as a short independent GIS project that will be directed by Dr. Rice during the final two weeks. Completion of the assigned weekly tutorial and the assigned GIS exercises are required, with submissions taking the form of maps, graphics, tables, statistics, written comments, and answers to the assigned exercises. Late GIS exercise submissions (those submitted after the deadline) will be penalized 10% for each day they are late, and will not be graded after the 10th day. The assigned GIS Exercises are cumulatively worth 40% of the final grade.

d. Examinations: There will be 2 examinations, which must be completed in the prescribed time period. These examinations will cover the Longley et al. textbook readings as well as the material in the video lectures. The exams will include multiple choice questions, definitions, and short answer questions. The two exams will be worth 15% each and cumulatively worth 30% of the final grade.

10. GRADING SUMMARY

Students will be evaluated in the following areas, with the following grade weighting:

Reading Reflections (10%)
Class Discussions (10%)
GIS Exercises (40%)
Course Project (10%)
Examinations (30%)

Grades are assigned using a standard 10-point percentile grading scale:

Grade	%
A+	> 99
A	93 – 98.9
A-	90 – 92.9
B+	87 – 89.9
B	83 – 86.9
B-	80 – 82.9
C+	77 – 79.9
C	73 – 76.9
C-	70 – 72.9
D	60 – 69.9
F	0 – 59.9

11. RUBRICS

A. Reading Reflections

(1) Instructions:
Each student will prepare a Reading Reflection using the **Blackboard Journal** tool. The reading reflections will be assigned bi-weekly. The reading reflection will be evaluated and assessed by the Instructor and Teaching Assistant using the same Blackboard Journal tool.   Reading Reflections should not only be a summary of the material in the weekly readings and lectures, but should also be a concise synthesis of the material, including quotes, references, and relevant personal experiences or anecdotes.   A Reading Reflection will consist of a 150-200 word summary and synthesis of the weekly lectures and Longley et al. textbook readings.

(2) Reading Reflection Rubric
Adapted from http://ctfe.gmu.edu/teaching/grading/sample-rubric-for-grading-a-research-paper/

Reading Reflection Rubric				
Criteria	**Outstanding**	**Good**	**Fair**	**Poor**
Organization	Reading Reflection includes a short introduction, a body, and a short synopsis, and is well organized	The Reading Reflection is missing an introduction or synopsis and has minor organizational errors	The Reading Reflection is missing an introduction and a synopsis and is poorly organized	The reading reflection lacks coherent organization and structure and is missing an identifiable introduction, body, and synopsis
Length	150-200 words	Minor length deviation (<20%)	Major length deviation (20%-40%)	Length does not adhere or approach length requirements (> 40% deviation)
Syntax	Correct grammar and syntax	Minor syntax, grammar, and spelling errors	Multiple syntax, grammar, and spelling errors throughout Reading Reflection	Reading Reflection is replete with syntax, grammar, and spelling errors
Research and Content	The Reading Reflection contains relevant material from the lecture and reading material, and extends the material through a well-presented synthesis	The Reading Reflection contains material from the lecture and reading, with minor deficiencies, omissions, or irrelevant content	The Reading Reflection only partially relates to the reading and lecture material and contains much irrelevant content	The Reading Reflection does not relate to the lecture or readings at all
Points	10	7-9	5-6	5 or less

B. Class Discussions

Online Discussion Protocols and Discussion Rubrics. Dabbagh, N. Copyright 2000 - 2003. Adapted with permission of author. *Modified by Katrina Joseph (2012) and Matt Rice on 11/26/2013.*

(1) Instructions:

Participation will consist of the following two elements:
a) An initial post
b) At least one *substantive* reply to a classmate's post

Discussions will open on Blackboard on Monday at 6 a.m. EST. Submit your initial post no later than Thursday before midnight EST. Read your classmates' posts and reply to one of them before midnight Sunday, EST.

(2) Discussion protocols:

1) Discussion postings should be evenly distributed during the discussion period (not concentrated all on one day or at the beginning and/or end of the period).
2) Discussion postings should be a minimum of one 25 words and a maximum of 100 words. I encourage you to: • Address the questions or topic as much as possible (don't let the discussion stray).

- Use quotes that support your postings and include citations and references that support your discussion. The citations and references do not count toward your 25-100 word length.
- Build on others' responses to create threads.

3) Avoid discussion postings that are limited to 'I agree' or 'great idea', etc. If you agree (or disagree) with a posting then say why you agree by supporting your statement with concepts from the readings or by bringing in a related example or experience.

4) Include related prior knowledge (e.g., work experience, prior coursework, readings)

5) Use proper netiquette (i.e., the culture of communicating digitally).

(3) Grading rubric for evaluating discussions

Discussion Rubric

Criteria	Expected	Sufficient	Insufficient	Not Evident or Not Completed
Timely discussion contributions (initial post and reply post)	2 postings well distributed throughout the discussion period	2 postings distributed throughout the discussion period	1 posting somewhat distributed throughout the discussion period	0-1 postings not distributed throughout the discussion period
Responsiveness to discussions and demonstration of knowledge from readings	very clear that readings were understood and incorporated well into responses	readings were understood and incorporated into responses	postings have questionable relationship to reading material	not evident that readings were understood and/or not incorporated into the discussion
Adherence to discussion protocols (see above)	all 5 protocols adhered to	3-4 protocols adhered to	1-2 protocols adhered to	0 protocols adhered to
Points	**10**	**7-9**	**5-6**	**5 or less**

C. GIS Exercises

Each GIS Exercise will be graded out of 20 points, with 1 point for each answer indicated in the assigned problem set and extension problem. The Maribeth Price, Mastering ArcGIS Pro problem sets will generally be worth 20 points. A complete answer with the relevant units will be worth full credit for that problem. Students start with 20 points and receive a 1 point deduction for incorrect answers, and a ½ point deduction for minor errors such as a lack of units where required. Incorrect or incomplete answers (not including an omission of units, i.e., ft., yards, acres, miles, meters, etc.) will receive a full point deduction. GIS Exercises will have a full written evaluation and specific indicators of reasons for point deductions. GIS Exercises should be submitted through Blackboard in Microsoft Word format, using the relevant assignment link for the chapter due. GIS Exercises will be due on Sunday night at midnight of the week they are due.

D. **Exams**

Exams will be conducted and graded on Blackboard and will consist of multiple choice, true/false, fill-in-the-blank, short answer, and essay questions. The exams will be graded automatically after completion, for all questions except short answer and essay questions, which will be graded by the instructor or TA. Incorrect responses will be marked with a reference to the textbook section and lecture # with the information required for a correct response. The Instructor or TA will provide written feedback for short answer and essay questions. Each exam will be worth a total of 50-70 points, depending on configuration. The two exams and will be scaled to comprise 30% of the final grade.

12. STUDENT EXPECTATIONS

Academic Integrity

It is expected that students adhere to the George Mason University Honor Code as it relates to integrity regarding coursework and grades. The Honor Code reads as follows:

"To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this: Student members of the George Mason University community pledge not to cheat, plagiarize, steal and/or lie in matters related to academic work."

More information about the Honor Code, including definitions of cheating, lying, and plagiarism, can be found at the Office of Academic Integrity website at https://oai.gmu.edu

Discussion of work among students is encouraged. Collaboration and active participation in group discussions is important, but final work should reflect your own thinking and all submitted assignments **must be in your own words and reflect your individual work**. I reserve the right to use GMU-sanctioned tools for detecting and documenting plagiarism. If you have questions about what constitutes plagiarism, please ask me.

MasonLive/Email (GMU Email)
Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account. [See http://masonlive.gmu.edu/]

Patriot Pass
Once you sign up for your Patriot Pass, your passwords will be synchronized, and you will use your Patriot Pass username and password to log in to the following systems: Blackboard, University Libraries, MasonLive, myMason, Patriot Web, Virtual Computing Lab, and WEMS. [See https://password.gmu.edu/index.jsp].

University Policies
Students must follow the university policies. [See http://universitypolicy.gmu.edu].

Responsible Use of Computing
Students must follow the university policy for Responsible Use of Computing. [See http://universitypolicy.gmu.edu/policies/responsible-use-of-computing].

13. DIVERSITY

Diversity is an important in an academic environment, and is a priority for George Mason University.   See:
http://ctfe.gmu.edu/professional-development/mason-diversity-statement/

"George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty, and staff. Through its curriculum, programs, policies, procedures, services, and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds, and practices have the opportunity to be voiced, heard and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed."

14. RELIGIOUS HOLIDAYS

I am generally aware of some religious holidays and observations, and will help minimize difficulties for students of different faiths in terms of scheduling course assignments. It is the student's responsibility to speak to me in advance should their religious observances impact their participation in class activities and assignments. [See: http://ulife.gmu.edu/calendar/religious-holiday-calendar/]

15. SPECIAL NEEDS

If you have a documented learning disability or other condition that may affect academic performance you should: **1**) make sure this documentation is on file with the Office of Disability Services (SUB I, Rm. 2500; 993-2474; http://ds.gmu.edu/) so that they can make a determination about the accommodations you need; and **2**) communicate with me to discuss your accommodation needs or have the Office of Disability Services do so. I can provide proper accommodations with documentation and professional advice from the Office of Disability Services.

16. STUDENT SERVICES AND UNIVERSITY RESOURCES

University Libraries

The George Mason University Libraries provides resources for distance education students. For access to these resources and services, see http://library.gmu.edu/for/online .

Writing Center

The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing. You can now sign up for writing assistance through the Office of Digital Learning's Online Writing Center: http://writingcenter.gmu.edu

Counseling and Psychological Services

The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu].

Family Educational Rights and Privacy Act (FERPA)

The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights. [See http://registrar.gmu.edu/ferpa/].

17. TENTATIVE COURSE SCHEDULE (subject to change)

Students are responsible for keeping up with the textbook readings, lectures, GIS tutorials/exercises, project deliverables, and assessments. No makeup exams will be available. Readings assigned for the week & session should be completed before the scheduled date. **Any changes to this schedule will be announced in class and posted to the course Blackboard page.**

	Dates	Readings (Longley)	Pages	Topic	Reading Reflection	Discussion	GIS Exercises (Price)	Exams
Week 1	Jan. 25-31	1.1-1.4	pp.3-15	GIS History & Concepts		1	Install/Access ArcGIS	Pretest
Week 2	Feb. 1-7	1.4-1.7	pp.15-32	GIS History & Concepts	1		Tutorial 1	
Week 3	Feb. 8-14	6.1-6.3	pp.128-134	GIS Software		2	Price 1	
Week 4	Feb. 15-21	6.4-6.7	pp.135-151	GIS Software	2		Tutorial 2	
Week 5	Feb. 22-28	4.1-4.6	pp.77-85	Georeferencing		3	Price 2	
Week 6	Mar. 1-7	4.7-4.13	pp.86-98	Georeferencing	3		Price 3	
Week 7	Mar. 8-14	3.1-3.4	pp.55-61	Representing Geography		4	Price 4	
Week 8	Mar. 15-21	3.5-3.9	pp.62-76	Representing Geography	4		Tutorial 5	Exam 1
Week 9	Mar. 22-28	8.1-8.3	pp.173-183	GIS Data Collection		5	Price 5	
Week 10	Mar. 29-Apr. 4	8.4-8.7	pp.183-191	GIS Data Collection	5		Price 7	
Week 11	Apr. 5-11	7.1-7.2	pp.152-167	Geographic Data Modeling		6	Price 8	
Week 12	Apr. 12-18	7.3-7.4	pp.168-172	Geographic Data Modeling	6		Price 9	
Week 13	Apr. 19-25	11.1-11.6	pp.237-265	Cartography & Map Production		7	Price 10	
Week 14	Apr. 26-May 2	12.1-12.9	pp.266-289	Geovisualization	7		Project	
Week 15	May 3 - 10	5.1-5.5	pp.99-127	Accuracy & Uncertainty			Project	Exam 2

** NOTE: Any changes to this syllabus will be announced via email and posted on blackboard. For a general university schedule and calendar, see: https://registrar.gmu.edu/calendars/spring-2021/