GEOGRAPHY & GEOINFORMATION SCIENCE 553
GEOGRAPHIC INFORMATION SYSTEMS

1. INSTRUCTOR & TA

Instructor: Dr. Matt Rice
Term: Fall 2018
Class Day/Time: GGS 533, Wednesdays, 4:30pm-7:10pm (CRN 73613)
Class Location: GMU Exploratory Hall, Room 2310
Faculty Office: GMU Exploratory Hall, Room 2202
Faculty Office Hours: Monday & Wednesday 3:00-4:00pm
Instructor Email: rice@gmu.edu subject=[GGS 553]

Teaching Assistant: Palak Matta
Teaching Assistant Email: pmatta@masonlive.gmu.edu
Teaching Assistant Office Hours: *TBD*

I can be reached via email to arrange alternate office hours. 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 553]. **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 a graduate-level geographic information systems course 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 analytical procedures using geographic data. Students will learn data presentation, data analysis, and cartographic techniques using industry standard geographic information systems software. **Credit hours for this course: 3**

3. COURSE PREREQUISITES

The prerequisite is GGS 550 (Geospatial Science Fundamentals), which includes concepts and theories of cartography, remote sensing, air photo interpretation, Global Positioning Systems, spatial data structures, and geographic information systems. The undergraduate GIS course GGS 311 (Introduction to Geographic Information Systems) or equivalent is also useful. Students with a geospatial background and knowledge of the discipline will not need the prerequisite, but it is recommended.   Students without the prerequisite course or equivalent knowledge should talk with the instructor.

4. COURSE EXPECTATIONS

1. Graduate courses require dedication and organization. Proper preparation is expected every week. You are expected to complete the assignments and activities on or before the due dates, and to prepare for class by doing any assigned reading.
2. Students must check their GMU email messages on a regular 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. It is essential to communicate any questions or problems to me promptly.

5. LEARNING COMMUNITY

This course is taught face-to-face, but some course content may also be delivered via Blackboard Courses (Log into http://mymason.gmu.edu, select the Courses Tab, and the course can be found in the Course List).

Student can be assisted periodically 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 detailed hardware minimum specifications provided by Esri, the vendor of the GIS software we use for this course.

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. Also, make sure your computer is protected from viruses by downloading the latest version of Symantec Endpoint Protection/Anti-Virus software for free at http://antivirus.gmu.edu.

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 10.5.1 for Desktop. 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 technical support, which may be provided through GMU Patriot Tech.

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.
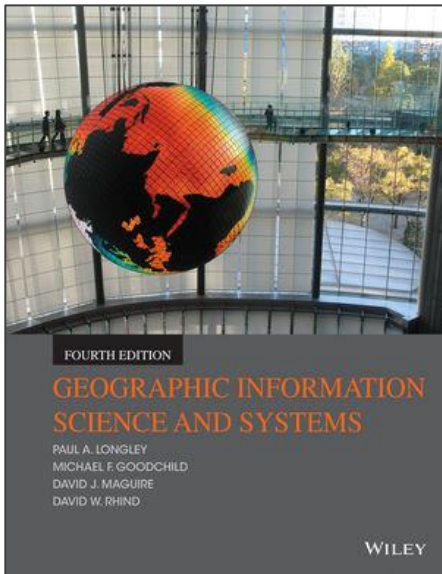
GGS 553: Geographic Information Systems Software

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 Desktop Advanced version 10.5.1** provided for you through a software download link. Although access to this GIS software is provided through computer labs all over 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 10.5.1 installed and running, you may be able to this computer for the GIS exercises and will not need to do the software install.
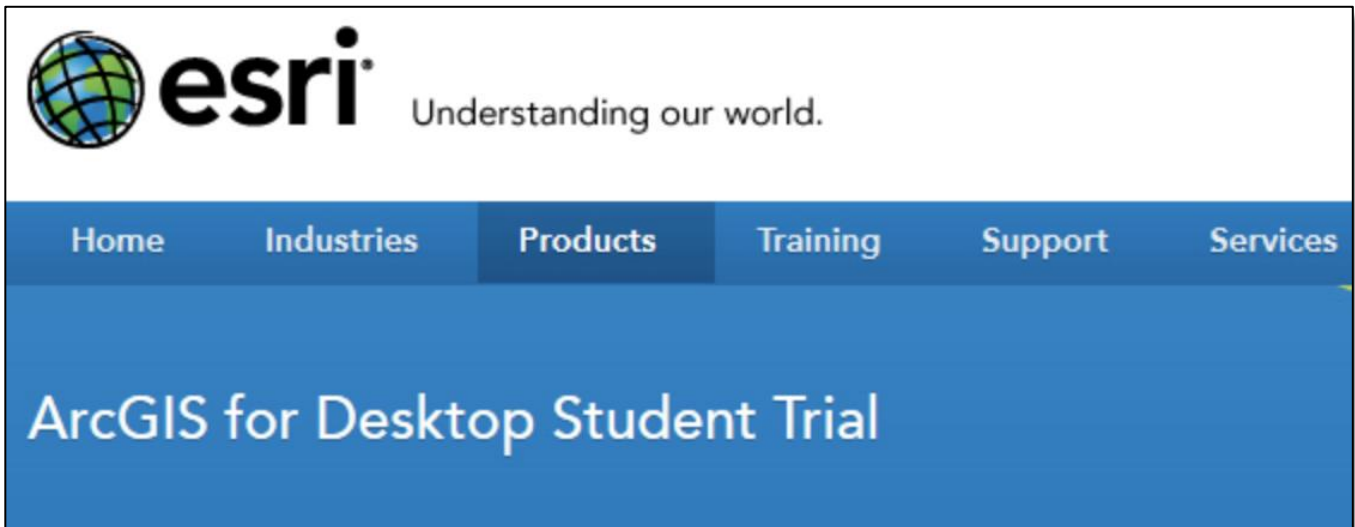
8. TEXTS & MATERIALS (required)

Textbooks must be purchased and available prior to the first day of class. The textbooks are widely available from a number of sources as new books, as used books, as e-books, and as rentals. The first book (Longley et al., "Geographic Information Science and Systems", 4th edition) is a traditional textbook that will be used for lectures. The second book (Price, "Mastering ArcGIS", 8th edition) is a GIS workbook with tutorials and exercises that will be due each week.   The Kemp Encyclopedia is available online for free through the Fenwick Library.

Geographic Information Science and Systems, 4th Edition

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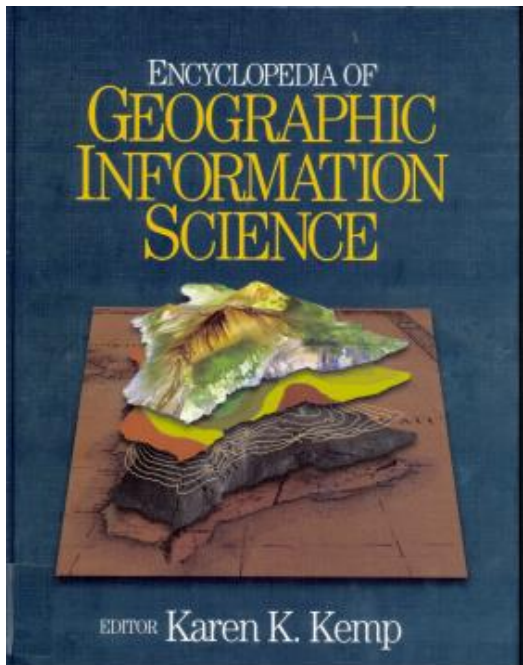**ISBN:** 978-1-119-03130-7
ISBN-13: 978-1118676950
ISBN-10: 1118676955

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

<u>Required</u>
(free access through Fenwick Digital Collections)

Encyclopedia of Geographic Information Science

Karen K. Kemp (editor)

Pub. date: 2008 | **Online Pub. Date:** April 21, 2008
DOI:http://dx.doi.org/10.4135/9781412953962
Print ISBN: 9781412913133
Online ISBN:9781412953962
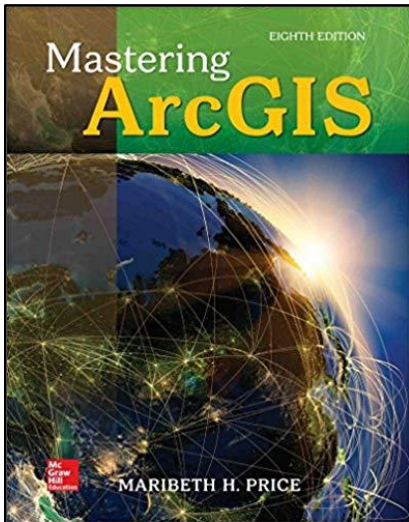**Publisher:** SAGE Publications, Inc.

Articles from this book will be accessed through the **GMU Fenwick Library's Digital Collections**:

http://mutex.gmu.edu/login?url=http://find.galegroup.com/gvrl/infomark.do?type=aboutBook&prodId=GVRL&eisbn=9781412953962&userGroupName=viva_gmu&version=1.0

* You must be logged in / authenticated or on campus to use this free resource.

Mastering ArcGIS, 8th Edition

By Maribeth Price

Copyright: 2019

Publication Date: January 30, 2018
ISBN-13: 978-1-259-92965-6
ISBN-10: 1-259-92965-5

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Data Storage

Each student must 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. USB Flash drives are available at Patriot Computer, Best Buy, Target, etc. . .

9. PERFORMANCE-BASED ASSESSMENTS

You will achieve the course learning outcomes **(Section 4)** through reading the textbook, attending and participating in the course lectures, participating in class discussions, working through GIS tutorials, completing lab exercises, completing a comprehensive course project, and taking an assessment exam at midterm and during finals week at the designated finals time.

You will achieve course goals and learning outcomes through attending the course lectures, reading the textbook or other assigned readings, participating in class discussions, working through GIS assignments, completing written assignments, and taking examinations at midterm and during finals week.

a. **GIS Lab Assignments**: There will be 14 separate GIS lab assignments, introduced in class and due 1 week later at the beginning of class unless otherwise indicated. Each assignment should take approximately 2-4 hours to complete, depending on your background. GIS lab assignments are accepted up to 10 days late Each day the assignment is late incurs a 10% penalty. The GIS Lab Assignments are each worth 100 points, and will collectively be worth 45% of the final grade.

b. **Written Assignments:** There will be 4 written assignments during the term, introduced in class and due 2 weeks later and the beginning of class, unless otherwise indicated. Late written assignments are accepted up to 10 days late. Each day the assignment is late incurs a 10% penalty. The written assignments will be graded out of 100 points, and will collectively be worth 25% of the final grade. See the Written Assignment Rubric on the following pages.

c. **Examinations:** There will be one final examination administered during the designated final examination time. The exam will be a combination of short answer, essay, and other material selected at the discretion of the Instructor. The final examination will be worth 100 points, and 25% of the final grade.

d. **Class Participation:** Attendance is expected and required. Students are expected to contribute to class discussions and participate in assigned discussion topics. Quizzes may be administered throughout the term at the discretion of the Instructor. Participation and quizzes will calculated as a 5% contribution to the final grade.

10. GRADING SUMMARY

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

GIS Exercises (45%)
Written Assignments (25%)
Final Exam (25%)
Class Participation, Quizzes (5%)

Grades are assigned using a modification of the standard scale:

A+	> 99
A	93 – 98.9
A-	90 – 92.9
B+	87 – 89.9
B	80 – 86.9
B-	70 – 79.9
C	60 – 69.9
F	0 – 59.9

11. RUBRICS

GIS Exercises

Each GIS Exercise will be worth 20 points, with 1 point for each substantive answer indicated in the assigned problem set, or other significant methodological step. With regard to numerical answers, 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 or incorrect execution of a method, 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 (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 or other relevant format as specified in the assignment. Cartographic work must be submitted in PDF format in highest quality, and according to standard cartographic conventions introduced in class.

Written Assignments

(1) **Instructions:**
Each student will prepare written assignments based on a set of readings, web material, journal articles, class lectures, and other assigned material. The written assignments will be evaluated and assessed by the Instructor and Teaching Assistant using the standard rubric below. Written assignments should be a concise, comprehensive synthesis of the assigned material, and can include quotes, references, and relevant personal experiences or anecdotes. The length of a typical written assignment will be 300-500 words, unless otherwise indicated.

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

Written Assignment Rubric				
Criteria	**Outstanding**	**Good**	**Fair**	**Poor**
Organization	Written Assignment includes a short introduction, a body, and a short synopsis, and is well organized	The Written Assignment is missing an introduction or synopsis and has minor organizational errors	The Written Assignment is missing an introduction and a synopsis and is poorly organized	The Written Assignment lacks coherent organization and structure and is missing an identifiable introduction, body, and synopsis
Length	300-500 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 Written Assignment	Written Assignment is replete with syntax, grammar, and spelling errors
Research and Content	The Written Assignment contains relevant material from the lecture and assigned content material, and extends the material through a well-presented synthesis	The Written Assignment contains material from the lecture and assigned content, with minor deficiencies, omissions, or irrelevant content	The Written Assignment only partially relates to the assigned content and lecture material and contains much irrelevant content	The Written Assignment does not relate to the lecture or readings at all
Points	**90-100**	**75-90**	**50-75**	**50 or less**

Final Exam

The final exam will consist of two sections, a computational exercise using ArcGIS, and a written exam containing reading, synthesis, and some calculations. The final exam will be presented in class and released on Blackboard on December 5th, and will be due on December 14th (Friday), via Blackboard. The two portions of the exam will be graded seperately, each with a percentile score between 0% and 100%. The two scores will be equally weighted to create a composite exam score (%) which will contribute 25% to the final course grade.

Class Participation

Students will be asked to provide verbal summaries of course readings from the Kemp Encyclopedia of Geographic Information Science, and will present the assigned topic to the rest of class. These topics will be assigned during the first two weeks and will be presented throughout the term. Student participation in this activity, and general class participation will contribution 5% to 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."

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 resouces 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. [See http://writingcenter.gmu.edu]. You can now sign up for writing assistance through the Office of Digital Learning's Online Writing Center [see http://odl.gmu.edu/resources/writing-center/]

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)

You 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.**

Week & Date	Topic	Readings (Longley et al)	Readings (Kemp & Other)	Written Assignments	GIS Topics, Tutorials & Exercises | Due Date
< *August 29th*			*Review syllabus, purchase textbooks*		
Aug. 29th	Introduction, Course Overview, GIS Introduction & History	1.1-1.7 pp.1-32			*Install ArcGIS Desktop, Explore ArcGIS Online* | **Sep. 5th**
Sep. 5th	GIS Overview, History	1.1-1.7 pp.1-32		**1:** GI**S**	Price Chapter 1: GIS Data, pp.9-42, #1-6 on p.42 | **Sep. 12th**
Sep. 12th	GIS Software	6.1-6.7 pp.128-151			Price Chapter 2: Managing GIS Data, pp.43-72, #1-4 on p.72 | **Sep. 21st**
Sep. 19th	Georeferencing	4.1-4.13 pp.77-98	Georeference		Price Chapter 3: Coordinate Systems, pp.73-106, #1-5 on p.106 | **Sep. 26th**
Sep. 26th	Georeferencing	4.1-4.13 pp.77-98	Gazetteer	**2:** Gazetteers	Price Chapter 4: Mapping GIS Data, pp.107-138 , #1-10 on p.138 | **Oct. 3rd**
Oct. 3rd	Representing Geography	3.1-3.9 pp.55-76			Price Chapter 5: Presenting GIS Data, pp.139-172, #1 on p.172 | **Oct. 10th**
Oct. 10th	Data Collection & Data Capture	8.1-8.7 pp.173-193	Goodchild (2007)		Price Chapter 6: Attribute Data, pp.173-204 #2-6 on p.204 | **Oct. 17th**
Oct. 17th	Data Collection & Data Capture	8.1-8.7 pp.173-193	Goodchild (2009)	**3:** VGI	Price Chapter 7: Basic Editing, pp.205-230 #6-7 on p.230 | **Oct. 31st**
Oct. 24th	Geographic Data Modeling	7.1-7.4 pp.152-172	Web GIS		Price Chapter 8: Queries, pp.231-258 #1-6 on p.258 | **Nov. 7th**
Oct. 31st	The GeoWeb	10.1-10.5, pp.217-236			Price Chapter 9: Spatial Joins, pp.259-288, #1-4 on p.288 | **Nov. 14th**
Nov. 7th	Cartography & Geovisualization	11.1-12.5 pp.237-289	Cartography, Geovisualization, Cartograms	**4:** Geoprivacy	Price Chapter 10: Map Overlay and Geoprocessing, pp.289-317, #1,2,6,7 on p.317 | **Nov. 23rd**
Nov. 14th	Uncertainty	5.1-5.5 pp.99-127	Accuracy, NMAS, Girres (2010), Haklay (2010)		Price, Chapter 11: Raster Analysis, pp.319-349, #1-4 on p.350 | **Nov. 28th**
Nov. 14th	**GIS Day** (attend for extra credit)				
Nov. 21st - 25th	*Thanksgiving Holiday*				
Nov. 28th	Uncertainty	5.1-5.5 pp.99-127		**5:** GIS Law, Ethics	Geocoding & Python Scripting | **Dec. 5th**
Dec. 5th	Future of GIS, Legal, Ethical Issues		Ethics in the Profession, Karjala (1995)		**Final Exam Presentation, Discussion**
Final Exam	The final exam will be overviewed in class on Dec. 5th and distributed via Blackboard at that time. The exam will be completed at home (outside of class) and turned in via Blackboard, no later than **Dec. 14th** (Friday) at midnight.				

** NOTES: Any changes to this syllabus will be announced via email and posted on blackboard. General university schedule and deadline information can be found at: https://registrar.gmu.edu/calendars/fall-2018/