



Department of Geography and Geoinformation Science

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GG550

Geospatial Science Fundamentals

Fall 2020

1. General Information

Instructor:	Dr. Arie Croitoru (a.k.a "Dr. C") Email: acroitor@gmu.edu
Teaching assistant:	Mr. Brad Gay Email: bgay2@gmu.edu
Where:	This course is a Distance Learning (DL) course
When:	Monday 4:30pm to 7:10pm.
Course website:	Blackboard
Credits:	3.0
Instructor's Office Hours:	Online only: Mon 9:30am - 10:30am, Tue 3:00pm - 4:00pm, or by appointment
TA's Office Hours:	Will be announced in class.
Preferred contact method:	Blackboard's course discussion boards (preferred) or by email. We will make every effort to respond within 24 - 48 hrs. during regular business hours Monday to Friday.

2. Course Goals

Spatial data and geospatial science have become a fundamental component in numerous application areas, ranging from homeland security to environmental, transportation, health, and marketing applications. The primary objective of this course is to review key foundations and principles in geospatial sciences, with a particular emphasis on both the theoretical and methodological aspects of spatial data acquisition, modeling, interpretation, and analysis. In particular, the goals of this course are:

- a) Provide an understanding of the fundamentals and theory of geospatial sciences.
- b) Introduce key analytical techniques and tools that are used in geospatial science.
- c) Develop the ability to describe, evaluate and apply selected processing methods.
- d) Identify and gain insight into some of the emerging trends in geospatial sciences.

3. Learning Outcomes

By the end of the course each student will:

- a) Have a broad knowledge base of fundamentals, theory and techniques in geospatial science.
- b) Be able to articulate and effectively communicate the basic concepts and ideas related to spatial data and geospatial science to domain experts, non-experts, and other professionals.
- c) Appropriately apply principles and perform basic computation and analysis tasks for various hypothetical and real-world tasks in geospatial science.

4. Delivery Method

The course will be taught as a combination of presentations, topic/problem-oriented discussion, tutorials, and self-paced review of assigned materials and assignments. Activities and assignments in this course will regularly use web-conferencing software (Blackboard Collaborate / Zoom). In addition, students are expected to have a device with a functional camera and microphone. In an emergency, students can connect through a telephone call, but video connection is the expected norm. Additional information on the hardware and software requirements for this course are available in Section 18 of the syllabus.

5. Textbooks

The following book is a required textbook for this course: “*Manual of Geospatial Science and Technology, 2nd Edition*” (2010), edited by J. D. Bossler, J. B. Campbell, R. B. McMaster, and C. rizo, CRC Press. This book is **available online** as an eBook through Mason’s library and will be used as the primary reading resource. Additional resources will be made available throughout the semester in Blackboard.

Please note that in addition to the required textbook you will be required to use a basic **scientific calculator** to course activities and tests. Unless specified otherwise, the use of mobile devices (e.g. phones or tablets) will not be permitted during scheduled tests and/or exams.

6. Course outline (tentative)

In this course we will cover the topics listed in the table below. Please note that the topics and their order are subjected to change at the discretion of the instructor (any changes will be announced in class). Any changes to the academic semester calendar will be announced by the University.

Date	Topic	Assignment Number	
		Released	Due
8/24	Overview and introduction		
8/31	Coordinates and coordinate systems		
9/7	*** No Class (Labor Day) ***		
9/14	2D Geometric Transformations	1	
9/21	Datums and reference systems		1
9/28	Map projections (Test 1)	2	
10/5	Geospatial data modeling		2
10/13 ⁽¹⁾	Spatial data acquisition methods: An overview	3	
10/19	Introduction to remote sensing: Radiation laws		3
10/26	Remote sensing data analysis (Test 2)	4	
11/2	Image interpretation & photogrammetry: An overview		4
11/9	Overview of spatial data analysis methods – raster	5	
11/16	Overview of spatial data analysis methods – vector		
11/23	Introduction to spatial data structures		5
11/30	Summary and conclusion (Test 3)		

Please note: Depending on availability, the course may include guest presentations during the semester. The dates and topics of the will be announced in class. The materials covered in any guest presentations will be considered part of the course materials and will be included in test and/or assignments as appropriate.

In addition to the course schedule outlined here, please refer to Mason’s academic calendar (Fall 2020) for information on important dates and follow Mason’s announcements on any calendar changes during the semester. In case of any discrepancy between the course schedule and Mason’s academic calendar, Mason’s calendar and announcements takes precedence. If the campus closes or class is canceled due to weather or other concern, students should check Blackboard as well as the Mason website for updates on how to continue learning and information about any changes to events or assignments.

7. Course Expectations

- This is a science course that involves the use of some mathematical and statistical concepts, as well as basic data processing.
- Your work should show attention to detail, professionalism, and should reflect graduate level course-work work at the College of Science.
- I expect preparation and participation in every class. Attendance is critical (attendance may be verified during class) - you are expected to be at all classes and to make productive use of class time. Your active participation in the class is essential to the success of this course.
- Please be respectful of your peers and your instructor and do not engage in activities that are unrelated to the class. Such disruptions show a lack of professionalism and may affect your participation grade.

¹ Class meets on Tuesday 10/13/2020 per GMU Fall 2020 calendar

8. Grades

During the course you will be responsible for completing several written assignments and in-class tests. In addition, you will be required to write a blog and to actively participate in class discussions. Each assignment and written test will be given a numerical grade on a 0-100 scale, and some assignments may include bonus tasks. At the end of the class all the marks will be totaled as a weighted average according to the following percentages:

Assignments	45%
In-class written tests (3×15)	45%
Class attendance and participation	10%
Total	100%

Please note that, in general, assignments will not have the same weight. The weight of each individual assignment will be indicated on the assignment form. Final grades at the end of the course will be assigned using a **combination of absolute achievements and relative standing in the class**.

Incomplete grades policy: following the university policies, an “Incomplete” grade (IN) may be assigned to a student who is passing a course but who may be unable to complete scheduled course work due to a cause beyond reasonable control. Any requests for an incomplete grade must be submitted in writing during the last week of the course and should clearly demonstrate “a cause beyond reasonable control”. IN grade requests will be evaluated on a case-by-case basis. If an incomplete grade is granted, it is **your responsibility** to make proper arrangements for completing any missing work as well as to submit it to the instructor by the due date, as indicated by the Registrar's office (see <https://catalog.gmu.edu/policies/academic/grading/> for details about the IN grade).

9. Tests

The course includes mandatory written tests. The material covered in the tests will be announced in class or in the course website prior to the test. Generally, all test dates are firm, and exceptions to the test dates (e.g., test “make-up” dates) will not be made. A student who cannot write a course test because of an incapacitating illness or severe domestic affliction may apply for an alternative date for writing an exam (see also Section 12).

Please note: Deferral of a test is a privilege and not a right; there is no guarantee that a deferral will be granted.

10. Assignments:

The course will include several mandatory written assignments on selected topics from the material covered in class and in the assigned reading. The purpose of these exercise is to provide you with an opportunity to further explore the topics and materials covered in class and in the reading assignments, as well as provide you with some “hands-on” experience. One to two weeks will be allocated for every assignment (please see Section 11 for details on late work policy). The due date of each assignment as well as its relative weight in your grade will be indicated on the assignment form. The submission of assignments should be done only **through the Blackboard course website**.

Please note: Unless noted otherwise, we will only grade assignments that are submitted through the “Assignments” section of the Blackboard system. Please **DO NOT** email assignments directly to the instructor’s or the TA’s @gmu.edu or through their Blackboard email.

11. Late work policy:

Assignment submitted between 1 to 3 calendar days past the due date would result in a late penalty of **5 points per day**. As a general rule, assignments submitted after **more than 3 days will not be accepted** and incomplete assignment work may not be completed after the due date. Exceptions to this policy may be made under special circumstances on a case-by-case basis at the discretion of the Instructor.

Please note: Deferral of course work is a privilege and not a right; there is no guarantee that a deferral will be granted. Please make sure you notify the instructor or the teaching assistant in writing as soon as you know a deferral is required.

12. Safe return to campus (COVID-19)

Students are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (www2.gmu.edu/safe-return-plan). Please continue to monitor and follow any university announcements and policy changes regarding the safe return to campus during the semester. Students who become ill with COVID-19 (or are quarantined) and as a result are unable to complete required coursework should contact the instructor to discuss a possible remedial plan for any missed work.

13. Course website:

The course has a Blackboard website. This website will provide you a single portal through which you may obtain lecture notes, retrieve assignment data and, review links to additional materials, and receive special announcements. You are required to visit the course website **regularly**. Please notify ITU (and, if necessary, the instructor) if you encounter any problems accessing this website.

14. Electronic communication:

- All course related correspondence should be made through the discussion board on course Blackboard website. Please refrain from emailing the instructor or the TA through their "@gmu.edu" address regarding general questions, as it is very likely that other students would benefit from your questions. If you wish to email the course teaching team directly please include "GGS550Fa20" at the beginning of the email subject line.
- Students must use their MasonLive email account to receive important University information, including communications related to this class. I will not respond to messages sent from or send messages to a non-Mason email address.
- 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 <https://masonlivelogin.gmu.edu/login>].

15. Academic integrity:

Mason is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process (academicintegrity.gmu.edu). 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. Students are urged to familiarize themselves with the provisions of the **GMU honor code** (available online at the link provided above).

16. Recording and/or sharing class materials

- This class or portions of this class will be recorded by the instructor for educational purposes. These recordings will be shared only with students enrolled in the course through the course website. Your instructor will communicate how you can access the recordings.
- Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy. Students requesting the use of assistive technology as an accommodation should direct such requests to the Office of Disability Services (see Section 17 for details).
- Sharing of instructor-created or other materials created or provided as part of the course (including recordings), and in particular materials relevant to assignments or exams, to public online "study" sites is considered a violation of Mason's Honor Code. For more information, see the Office of Academic Integrity's [summary of information about online study sites](#). Please review the following [short video](#) regarding sharing course materials online.

17. Students with special needs:

Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu | Phone: (703) 993-2474. All academic accommodations must be arranged through the Office of Disability Services (ODS). Please do not hesitate to contact the course team regarding your special needs if you encounter any issues.

18. Technology requirements

In order to be able to fully participate in this course you are required to have regular, reliable access to the following hardware and software components:

Hardware:

- An Intel-based computer with an up-to-date operating system (Windows 10 or Mac OSX 10.13 or higher), **at least 4 GB of RAM** (8GB recommended) and a dual core or better processor.
- A computer graphics card (either integrated or standalone). A standalone graphics card with at least 2GB - 4GB of ram (depending on your screen size) is recommended but not required
- A **stable** broadband Internet connection (cable modem, DSL, satellite broadband, etc.), with a consistent 1.5 Mbps download speed or higher.
- A microphone (either built-in or as a separate device). A computer headset or “ear buds” with a built-in microphone is highly recommended. If you are using a built-in or a separate microphone a headset is recommended to prevent sound issues.
- A web camera is highly recommended but not required.
- A basic scientific calculator is generally required for this class (see Section 9 for additional details on the use of technology in tests).

Software:

- A supported up-to-date web browser (check [which browsers are supported by Blackboard](#)). You can check if your particular browser setup (including any plugins) is supported by Blackboard [HERE](#).
- Blackboard (available upon logging into <http://mymason.gmu.edu>)
- Zoom (available at <https://gmu.zoom.us/>)
- Adobe Acrobat Reader ([free download](#))
- Citrix Workspace App (see <https://its.gmu.edu/service/citrix-virtual-lab/> for instructions)
- Cisco AnyConnect VPN (see <https://its.gmu.edu/knowledge-base/how-do-i-install-the-vpn/> for instructions)
- A document editing software, such as Microsoft Word ([part of Office 365 ProPlus](#)) or [OpenOffice](#)

19. Use of technology in class:

- During instructor-led class activities you are expected to use your computer and other electronic device(s) only for activities **directly** related to class activities (e.g., viewing class notes or participating in a class activity).
- The use of mobile devices will not be permitted during class (unless it is a part of an approved ODS accommodation plan). Such usage often distracts you from your class experience, disrupts other students as well as your teaching team, and shows a lack of professionalism. Improper use of electronic devices in class may affect your attendance and participation grade.

20. Diversity and inclusion

The course team is committed to upholding Mason’s [Non-Discrimination Policy](#) and [Diversity](#) core values. *We welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.*

21. Title IX

George Mason University is committed to providing a learning, living and working environment that is free from discrimination and a campus that is free of sexual misconduct and other acts of interpersonal violence in

order to promote community well-being and student success. We encourage students who believe that they have been sexually harassed, assaulted or subjected to sexual misconduct to seek assistance and support. [University Policy 1202: Sexual Harassment and Misconduct](#) speaks to the specifics of Mason's process, the resources, and the options available to students.

As a faculty member and designated "Responsible Employee," I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's [Title IX Coordinator](#) per [university policy 1412](#). If you wish to speak with someone confidentially, please contact the [Student Support and Advocacy Center](#) (703-380-1434) or [Counseling and Psychological Services](#) (703-993-2380). You may also seek assistance from [Mason's Title IX Coordinator](#) (703-993-8730; titleix@gmu.edu).

22. Other useful campus resources:

- a. **University Libraries** - University Libraries provides resources for distance students. [See <http://library.gmu.edu/distance>].
- b. **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 an Online Writing Lab (OWL) session just like you sign up for a face-to-face session in the Writing Center, which means YOU set the date and time of the appointment! Learn more about the [Online Writing Lab \(OWL\)](#) (found under Online Tutoring).
- c. **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>].
- d. **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/privacy>].

Disclaimer: Any typographical errors in this Course Outline are subject to change and will be announced in class. If this course includes a final exam (see course schedule) then the date of the final examination is set by the Registrar and takes precedence over the final examination date reported by the course team.

Appendix

General guidelines for assignment preparation and submission

(Specific instructions may also be available on [the course website](#))

Grades of assignments will be based on:

- a) **Academic merit** of your answers.
- b) **Conciseness** and **completeness** of your answers. Please write to the point and explicitly address the question or task. Avoid using unnecessary graphics (figures, tables, graphs etc.) unless they serve a specific purpose and are referred to in the text. Make sure to use captions and to refer to the graphics you include in your written answer. Graphics without any reference or accompanying explanation will be disregarded.
- c) **Presentation**. Treat your assignments deliverables as a professional product of your work and remember that such products are considered as evidence of your thinking and learning process. Please organize your report in a logical fashion so that your answers could be easily identified. A general format for your presentation should, as a minimum, include the following components: (1) a cover page clearly indicating your name, the course number, the assignment number, and the submission date (2) Question number, (3) Your written answer and/or description and discussion of your results, and (4) Visualization of your results, e.g. images, graphs, tables, as necessary.
- d) **Organization**. Your assignment should be submitted as a single PDF file containing your assignment report. If you are required to submit multiple files all files (including the report) should be submitted in a single ZIP file.

Additional hints:

1. Please remember that your assignment is a **professional document** and should therefore be formatted and constructed accordingly. All assignments are to be typed and should have no grammatical or typographical errors. Hand-written assignments – or scanned hand-written documents – will not be accepted.
2. Submission of a softcopy of your assignment will be made through Blackboard. It is **not** required to submit a hardcopy of your assignment. The submission date of your assignment is the submission date indicated by Blackboard.
3. The electronic submission of your assignment report should be made in a PDF format. Please do not submit MS-Word files!
4. Avoid using screenshots whenever possible. Instead use the print option in the software you are using to produce a PDF document or an image.
5. If more than one file is submitted, you may submit a single **ZIP** file containing all the assignment files. Please note that other compression formats (e.g. rar files) will not be accepted.
6. Please make sure you have a backup of all the materials you submit.