Term Information

Effective Term	Spring 2021
Previous Value	*Autumn 2020*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

We are proposing this course be offered in alternative formats. In addition to the traditional in person lecture, we propose to teach this course as a completely online course.

What is the rationale for the proposed change(s)?

The new format will make the course more available to students in all terms who need the course offered in an alternative format to accommodate work or athletic schedules, greater accessibility needs, as well as to accommodate students who are away from the OSU campus. The COVID-19 pandemic has also made it necessary for our courses to have online offerings. Alternative formats will also provide greater capacity potential enrollments without detracting from student learning and instructor engagement.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

None

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Geography
Fiscal Unit/Academic Org	Geography - D0733
College/Academic Group	Arts and Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5212
Course Title	Geospatial Databases for GIS
Transcript Abbreviation	Geospatial Data
Course Description	Focuses on designing, implementing, querying and managing spatial databases or persistent data stores where most entities have footprints in geographic space and time. This is critical for designing and implementing GIS for projects and organizations. It is also crucial for moving beyond GIS to the bigger world of geographic information services.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	100% at a distance
Previous Value	*No*
Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture, Recitation

Grade Roster Component	Laboratory
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	GEOG 5210 and CSE 1114, or consent of instructor.
Previous Value	*Prereq: A grade of C- or above in 5210 and CSE 1114.*
Exclusions	
Electronically Enforced	Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	45.0701
Subsidy Level	Doctoral Course
Intended Rank	Senior, Masters, Doctoral

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors

Course Details

Course goals or learning objectives/outcomes	• Understand database design with spatial objects;
	• Be able to write spatial queries;
	• Understand physical data storage and performance tuning;
	• Understand spatio-temporal and moving objects data;
	• Have practical GIS data skills
Content Topic List	• GIS
	• Spatial databases
	• Spatial queries
	• Spatial data modeling
Sought Concurrence	No

Attachments

- GEOG5212-online-geospatial-databases.docx: Syllabus (online)

  (Syllabus. Owner: Xiao,Ningchuan)

- GEOG5212-inperson-geospatial-databases.pdf: In-person syllabus

  (Syllabus. Owner: Xiao,Ningchuan)

- GEOG5212-asctech-review.docx: ASCTech review (online)

  (Other Supporting Documentation. Owner: Xiao,Ningchuan)

- GEOG5212-online-geospatial-databases_revised.docx: Syllabus (online) - revised

  (Syllabus. Owner: Xiao,Ningchuan)

Comments

- Two contingencies are address. The prerequisites in the system are now consistent with the syllabus. *(by Xiao,Ningchuan on 10/20/2020 09:45 AM)*

- Please see 9-24-20 email to N. Xiao and N. Ettlinger *(by Oldroyd,Shelby Quinn on 09/24/2020 05:16 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Xiao,Ningchuan	07/20/2020 01:50 AM	Submitted for Approval
Approved	Munroe,Darla Karin	07/24/2020 05:34 PM	Unit Approval
Approved	Haddad,Deborah Moore	07/25/2020 09:03 AM	College Approval
Revision Requested	Oldroyd,Shelby Quinn	09/24/2020 05:16 PM	ASCCAO Approval
Submitted	Xiao,Ningchuan	10/20/2020 09:45 AM	Submitted for Approval
Approved	Munroe,Darla Karin	10/20/2020 09:50 AM	Unit Approval
Approved	Haddad,Deborah Moore	10/20/2020 10:23 AM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Oldroyd,Shelby Quinn Vankeerbergen,Bernadette Chantal	10/20/2020 10:23 AM	ASCCAO Approval

THE OHIO STATE UNIVERSITY

SYLLABUS
GEOG5212
GEOSPATIAL DATABASES FOR GIS
AUTUMN 2020 - ONLINE

Course overview

Instructor

Instructor: Dr. Emily S. Castellucci
Email address: castellucci.5@osu.edu
Office hours: See the CarmenCanvas Calendar
Office Location: CarmenZoom

Course description

This course focuses on designing, implementing, querying, and managing geospatial databases or persistent data stores where most entities have footprints in geographic space and time. This is critical for designing and implementing GIS for projects and organizations. It is also crucial for moving beyond GIS to the bigger world of geographic information services.

In designing any GIS project, a fundamental decision is how to represent the world of interest in the computer. This is critical since no GIS or spatial analysis tools – no matter how powerful – can extract more information than is designed in the database representation. The growing size of geospatial databases requires these databases to support efficient querying and searching.   A well-designed spatial database can also evolve as the questions in the project or organization change over time.   A poorly designed spatial database is difficult to rewind and fix.

Understanding spatial database design and management is not only essential for designing and implementing GIS, but also to support a much wider range of geographic information services such as Google Maps and location-based services such as the location apps on your smartphone. This is a much bigger market than the market for professional GIS service.

Database technologies. The most common spatial database management system (SDBMS) technology is a specialized object-relational database management system (ORDBMS). An ORDBMS supports objects within a relational (table-based) database and its associated

query language, Structured Query Language (SQL). An ORDBMS is a SDBMS if it also supports spatial objects through spatial indexing and spatial (geometric) operations.

ORDBMS with spatial objects is the approach used by ESRI's Geodatabase as well as open-source software such as PostGreSQL/PostGIS. It is also supported by other major vendors such as IBM.

In this course, we will be working with ESRI's ArcGIS Geodatabase and PostGreSQL/PostGIS. There will be a series of assignments using these technologies. These will be provided via the course website and discussed in class.

Course learning outcomes

By the end of this course, students should successfully be able to:
- Understand database design with spatial objects.
- Write spatial queries.
- Understand physical data storage and performance tuning.
- Understand spatio-temporal and moving objects data.
- Have practical GIS data skills.

How This Course Works

Mode of delivery

This course is 100% online. *There are no required sessions when you must be logged in to Carmen at a scheduled time.*

Pace of online activities

This course is divided into **weekly modules** that are released at least one week ahead of time. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame. All course materials, lectures, labs, exams, and participation opportunities can be found on the course website, under Modules, organized according to the week that they are assigned.

Credit hours and work expectations

This is a **3-credit-hour course**. According to Ohio State policy, students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average.

Prerequisites

GEOG 5210 and CSE 1114, or consent of instructor.

Course materials

Additionally, excerpts from the following texts are provided in digital (PDF) format:

- **B**: Bolstad, P. (2019). *GIS Fundamentals*, 6th edition.
- **CM**: Coronel, C. & Morris, S. (2016). *Database Systems: Design, Implementation, and Management*, 12th edition.
- **EN**: Elmasri, R. & Navathe, S. (2016). *Fundamentals of Database Systems*, 7th edition.
- **N**: Nasser, H. (2014). *Learning ArcGIS Geodatabases*.
- **OH**: Obe, R. & Hsu, L. (2015). *PostGIS in Action,* 2nd edition.
- **R+**: Rigaux, P., Scholl, M., & Voisard, A. (2002). *Spatial Databases with Application to GIS*.
- **RG**: Ramakrishnan, R. & Gehrke, J. (1999) *Database Management Systems*, 2nd edition.
- **SC**: Shekhar, S. & Chawla, S. (2003) *Spatial Databases: A Tour*.
- **WD**: Worboys, M. & Duckham, M. (2004) *GIS: A Computing Perspective*, 2nd edition.
- **Z**: Zeiler, M. (2010) *Modeling Our World: The ESRI Guide to Geodatabase Concepts*, 2nd edition.

Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** http://ocio.osu.edu/selfservice
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Baseline technical skills for online courses

- Basic computer and web-browsing skills
- Navigating Carmen: for questions about specific functionality, see the Canvas Student Guide.
- CarmenZoom virtual meetings

Required equipment

- Computer: current PC (Windows 7+) or Mac (OS X) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in or external microphone, fully installed

Required software

Please keep in mind that you are NOT required to purchase any software for this class. The following list should help you access the software free-of-cost to you as a student in this class.

- [Microsoft Office 365 ProPlus](#) All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Each student can install Office on five PCs or Macs, five tablets (Windows, iPad® and Android™) and five phones.
    - o Students are able to access Word, Excel, PowerPoint, Outlook and other programs, depending on platform. Users will also receive 1 TB of OneDrive for Business storage.
    - o Office 365 is installed within your BuckeyeMail account. Full instructions for downloading and installation can be found at https://ocio.osu.edu/kb04733.
- ArcGIS Pro
    - o ArcGIS Pro is provided free-of-cost to OSU students, staff, and faculty for educational and research purposes under the ESRI Education Site License Program. You may review ESRI's privacy policies at Esri Privacy.
    - o Full instructions for downloading and installing can be found at https://osu.box.com/s/qxrdqgoni1qvhc0esjgxvm5dpoxhypvl. **_DO NOT attempt to download and install this software using any other method._** Otherwise, you might end up with the wrong software, the wrong version of the software, or a paywall when you should have free and unlimited access while a student.
    - o For information about accessibility, visit Accessibility in ArcGIS Pro.
    - o Note for Mac users: ArcGIS Pro requires a Windows operating system. If you can install Windows on your Mac using Parallels, Boot Camp, VMWare Fusion, or a similar program, then you should be to install ArcGIS Pro. If installing Windows on your machine is not an option, then you will need to access this software using the RemoteLab option (see below).
    - o Email esri-support@osu.edu for ArcGIS Pro technical support. If they are unable to help you install ArcGIS Pro on your machine, then you will need to access this software using the Remote Lab option (see below).
- QGIS
    - o This is the leading open source desktop GIS software that is available free-of-cost. You can download the software from here: https://qgis.org/en/site/forusers/download.html.
    - o Successful download and installation of QGIS is ultimately the student's responsibility. You may contact your instructor/TA with installation-related questions, but we cannot guarantee that we'll be able to resolve all issues. If you are unable to install QGIS on your own machine, then you will need to access this software using the RemoteLab option (see below).
- PostgreSQL, PostGIS, and pgAdmin
    - o PostgreSQL, also known as Postgres, is a free and open-source relational database management system emphasizing extensibility and SQL compliance. PostGIS is an open source software program that adds support for geographic

objects to the PostgreSQL object-relational database. pgAdmin is a management tool for PostgreSQL.

- o You can download and install PostgreSQL and PostGIS from this site: https://www.postgresql.org/download.
    - This site is where you can download the installer for PostgreSQL, and it is during the final step of installing PostgreSQL that you have the option to install additional packages as well. You want to do this, because this is when you'll have the opportunity to select PostGIS, which will then be installed.
    - Additionally, remember to record any passwords and port numbers that you create during the installation process. You'll need this information.
- o You can download and install pgAdmin from this site: https://www.pgadmin.org/download.
- o Successful download and installation of PostgreSQL, PostGIS, and pgAdmin is ultimately the student's responsibility. You may contact your instructor/TA with installation-related questions, but we cannot guarantee that we'll be able to resolve all issues. If you are unable to install PostgreSQL, PostGIS, and pgAdmin on your own machine, then you will need to access this software using the RemoteLab option (see below).
- RemoteLab
    - o If you have any trouble with downloading, installing, or using ArcGIS Pro or QGIS on your own machine, you may access the computers in the Derby Hall 0135 and 0140 computer labs via remotelab.osu.edu.
    - o Instructions for using RemoteLab can be found at this Google Doc.
    - o Important: It is best if you can download, install, and use ArcGIS Pro and QGIS on your own machine, rather than via RemoteLab, because there are a limited number of computers available remotely, so please only use this option of absolutely needed.
    - o Email Jens Blegvad at belgvad.1@osu.edu for RemoteLab technical support.

Carmen Access

You will need to use BuckeyePass multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.

- Download the [Duo Mobile application](#) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

Grading and faculty response

Grades

Assignment or category	Percentage
Participation	10
Exams (6)	42
Labs (12)	48
Total	100

See course schedule, below, for due dates

Assignment information

Participation

With each module, there will be 1-2 participation activities, usually 0.5-1 point each. Your goal is to accumulate 10+ points to receive full credit for the participation portion of your grade.

Exams

There will be 6 short, noncumulative exams. Each exam will be…

- *Timed.* (If you are registered with SLDS for extended time accommodations, please confirm that extended time has been granted before you begin the exam.)
- *Open-note.* This means that you can use the lecture slides, the handouts, your notes, the textbook, etc.
- *Completed independently.* You should complete the exam by yourself. Collaboration with one or more other persons will be considered academic misconduct.
- *Allowed only one attempt.* Be sure that you are ready to complete the exam in one sitting before you begin.

- *Graded immediately*. Your grade should be visible as soon as you click Submit; if it is not, please notify your instructor. Correct answers will be posted once the "available until" date and time has passed (i.e. once the exam closes).
- *Password protected*. You'll find the password in the quiz instructions, so make sure you read the instructions before you click Take the Quiz.

Labs

There will be 12 labs. You will be provided with data and step-by-step instructions for each lab, but keep in mind that the process of completing any given lab may not go as smoothly as planned. Unexpected challenges may arise, so it is best to plan for this. Set a goal to submit each lab in advance of the deadline. That way, if unexpected challenges do arise, you have time to deal with them before the deadline passes.

If you need assistance with a lab, you are required to post your question(s) in the Q&A discussion board for that lab. If you attempt to contact your instructor/TA with your lab-related question, you will be directed to post your question in the discussion board before it is answered. (The only exception to this is grade-related questions. These are private!) Using the discussion boards for Q&A is how your instructor/TA can avoid answering the same questions repeatedly, and the discussion board becomes an excellent archive for editing the lab for use in future semesters.

Late assignments

- You can submit assignments up to **one week late** unless otherwise noted, and the late penalty is 5% (of the total possible score) per day. The late penalty will not reduce grades to below 70% (of the total possible score). Late penalties are managed by the course website and automatically applied.
- Extensions are NOT typically granted due to getting "stuck," encountering unexpected errors, software crashes, lost work, or other issues related to these. This is because these are realistic issues that you are likely to encounter when performing GIS work outside of this class, and you need to learn how to manage these issues. However, do keep in touch with your instructor/TA when issues arise so that we can provide support.

Grading scale

92.5–100: A
89.5–92.49: A-
86.5–89.49: B+
82.5–86.49: B
79.5–82.49: B-
76.5–79.49: C+
72.5–76.49: C
69.5 –72.49: C-
66.5 –69.49: D+

59.5 –66.49: D
Below 59.5: E

Instructor feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course.

Grades and feedback

You can generally expect grades and feedback to be returned within **7 days** once the assignment's deadline has passed. More or less time may be needed, depending on the complexity of the assignment.

E-mail and discussion boards

I usually reply to e-mails and discussion board posts within **24 hours on school days**. This usually occurs during normal work hours (8am-5pm), and although I might reply to emails outside of those hours, please do not expect this.

What should I call my instructor?

Use the proper title when addressing your instructors/TAs. Recommended resource: [What should I call my professor?](#) For example: Because Emily S. Castellucci has a Ph.D., it's always Dr. Castellucci, *never* Ms., Mrs., or Miss.

Attendance, participation, and discussions

Student participation requirements

Because this is a distance-education course, your attendance is based on your online activity and participation. The following is a summary of everyone's expected participation:

- **Logging in**: **AT LEAST ONCE PER WEEK**
  Be sure you are logging in to the course in Carmen each week, including weeks with holidays or weeks with minimal online course activity. (During most weeks you will probably log in many times.) If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible.*
- **Office hours and live sessions**: **OPTIONAL**
  All live, scheduled events for the course, including my office hours, are optional.
- **Participating in discussion forums: 0-2 TIMES PER WEEK (FLEXIBLE)**
  There are two ways that we'll be using discussion forums.
  - In each module, there will be 1-2 participation activities (each worth 0.5 - 1 point), and many of these activities will require participation in a discussion

forum. Your goal is to accrue 10+ points by the end of the semester, which allows some flexibility for which participation activities you choose to complete.

- o There is a Q&A discussion forum for every lab. These forums are for addressing lab-specific questions, and you may engage with these forums as needed. Participating in these forums does not affect your participation grade.

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. (Note: Excessive grammar, spelling, or punctuation errors in discussions or any other assignment submissions may be penalized at the discretion of the instructor/TA.) A more conversational tone is fine for non-academic topics.
- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work**: Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Other course policies

Academic integrity policy

Ohio State's academic integrity policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's *Code of Student Conduct*, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and

possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. (Note that "warnings" are not given due to an offense being one's first offense, due to ignorance of what constitutes academic misconduct, or due to any other circumstances.) If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

Other sources of information on academic misconduct (integrity) to which you can refer include:
- The Committee on Academic Misconduct web pages (COAM Home)
- *Ten Suggestions for Preserving Academic Integrity (Ten Suggestions)*
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Academic integrity information specific to this course

Collaboration for the purposes of troubleshooting is highly encouraged in this course, but everyone is expected to complete all assignment tasks themselves and submit their own unique work. With this in mind, here are some examples of acceptable and unacceptable behavior:
- Acceptable:
  - Asking a classmate how to resolve an unexpected error message, how to find a hidden setting in the software, or similar troubleshooting tasks.
  - Participating in a study group study the course material.
  - Asking a trusted person to proofread (without revising or rewriting) your assignments before you turn them in.
- Unacceptable:
  - Using another student's work (in part or in full) as your own.
  - Sharing files and/or using shared files that contain intermediate or final results.
  - Submitting the same work (even if modified) from a past semester or from another course.
  - Comparing and/or sharing answers before submitting a graded assignment.
  - Forgetting to cite sources, including the course materials, websites visited, etc.

There are many other acceptable/unacceptable actions than those exemplified here, so if you have any questions or concerns about acceptable/unacceptable actions or what constitutes academic misconduct in this course, ask your instructor for clarification/permission.

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on title IX

All students and employees at Ohio State have the right to work and learn in an environment free from harassment and discrimination based on sex or gender, and the university can arrange interim measures, provide support resources, and explain investigation options, including referral to confidential resources.

If you or someone you know has been harassed or discriminated against based on your sex or gender, including sexual harassment, sexual assault, relationship violence, stalking, or sexual exploitation, you may find information about your rights and options at titleix.osu.edu or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu. Title IX is part of the Office of Institutional Equity (OIE) at Ohio State, which responds to all bias-motivated incidents of harassment and discrimination, such as race, religion, national origin and disability. For more information on OIE, visit equity.osu.edu or email equity@osu.edu.

Statement on diversity

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Accessibility accommodations for students with disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- CarmenCanvas accessibility
- CarmenZoom accessibility

Your mental health!

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at suicidepreventionlifeline.org.

Disclaimer

This course syllabus provides a general plan for the course; deviations may be necessary. Such deviations may be made for individuals or for the entire class, as deemed appropriate

by the instructor. Any changes that affect the entire class will be announced by the instructor with as much advance notice as possible.

Course schedule

Week	Days	Start Date	End Date	Activities
1	1-5	T 8/25	M 8/31	Course Introduction
				Lab 0 - Setting Up
2	6-10	T 9/1	T 9/8	Lecture 1 - Databases
				Lab 1 - Geodatabases in ArcGIS - Part 1
3	11-15	W 9/9	T 9/15	Lecture 2 - Spatial Databases
				Exam 1 - Lectures 1-2
4	16-20	W 9/16	T 9/22	Lab 2 - Spatial Databases with PostGIS - Part 1
5	21-25	W 9/23	T 9/29	Lecture 3 - Conceptual Data Modeling
				Lab 3 - Geodatabases in ArcGIS - Part 2 and Case Study - Part 1
6	26-30	W 9/30	T 10/6	Lecture 4 - Logical Data Modeling and Normalization
				Lab 4 - Spatial Databases with PostGIS - Part 2 and Case Study - Part 2
				Exam 2 - Lectures 3-4
7	31-35	W 10/7	T 10/13	Lecture 5 - Object-Orientation
				Lab 5 - Spatial Databases with PostGIS - Part 3 and Case Study - Part 3
8	36-40	W 10/14	T 10/20	Lecture 6 - Spatial Fields and Spatial Objects
				Lab 6 - Spatial Databases with PostGIS - Part 4 and Case Study - Part 4
				Exam 3 - Lectures 5-6
9	41-45	W 10/21	T 10/27	Lecture 7 - Querying and Relational Algebra
				Lab 7 - Spatial Databases with PostGIS - Part 5 and Case Study - Part 5
10	46-50	W 12/28	T 11/3	Lecture 8 - SQL and Spatial Querying
				Lab 8 - Spatial Databases with PostGIS - Part 6 and Case Study - Part 6
				Exam 4 - Lectures 7-8
11	51-55	W 11/4	T 11/10	Lecture 9 - Data Storage and File Structures
				Lab 9 - Spatial Databases with PostGIS - Part 7 and Case Study - Part 7
12	56-60	R 11/12	W 11/18	Lecture 10 - Non-Spatial Database Indices
				Lab 10 - Spatial Databases with PostGIS - Part 8
				Exam 5 - Lectures 9-10
13	61-65	R 11/19	W 11/25	Lecture 11 - Spatial Database Indices - Part 1
				Lab 11 - Geodatabases in ArcGIS - Part 3 and Spatial Databases with Post GIS - Part 9

14	66-70	M 11/30	F 12/4	Lecture 12 - Spatial Database Indices - Part 2
				Lab 12 - Spatial Databases with PostGIS - Part 10
15	Finals	M 12/7	F 12/11	Lecture 13 - Architectures
				Exam 6 - Lectures 11-13
				Course Conclusion

GEOG 5212 Geospatial Databases for GIS – Spring 2020

Meeting Times:
Lecture/Lab: TR 12:45-2:05pm, Derby Hall 135

Instructor Name and Email: Dr. Emily S. Castellucci, castellucci.5@osu.edu
Office Hours and Location: My office is Derby Hall 1168. To schedule a meeting with me, please visit the course website (Carmen) and go to Calendar > Find Appointment. By default, all meetings are 15 minutes in length. If you would like to meet for longer than 15 minutes, please schedule more than one meeting. Yes, you may schedule meetings back-to-back. If none of the times that I am available work for you, please email me with times that do work for you, and I'll see what I can do. If you cannot make your appointment, please cancel. Thanks so much!

Teaching Assistant(s):

Name	Email	Office Hours and Location
Nicholas Kinyanjui	kinyanjui.3@osu.edu	TR 2:30-3:15pm, Derby Hall 0160

Course Description: This course focuses on designing, implementing, querying, and managing geospatial databases or persistent data stores where most entities have footprints in geographic space and time. This is critical for designing and implementing GIS for projects and organizations. It is also crucial for moving beyond GIS to the bigger world of geographic information services.

In designing any GIS project, a fundamental decision is how to represent the world of interest in the computer. This is critical since no GIS or spatial analysis tools – no matter how powerful – can extract more information than is designed in the database representation. The growing size of geospatial databases requires these databases to support efficient querying and searching. A well-designed spatial database can also evolve as the questions in the project or organization change over time. A poorly designed spatial database is difficult to rewind and fix.

Understanding spatial database design and management is not only essential for designing and implementing GIS, but also to support a much wider range of geographic information services such as Google Maps and location-based services such as the location apps on your smartphone. This is a much bigger market than the market for professional GIS services.

Database Technologies: The most common spatial database management system (SDBMS) technology is a specialized object-relational database management system (ORDBMS). An ORDBMS supports objects within a relational (table-based) database and its associated query language, Structured Query Language (SQL). An ORDBMS is a SDBMS if it also supports spatial objects through spatial indexing and spatial (geometric) operations.

ORDBMS with spatial objects is the approach used by ESRI's Geodatabase as well as open-source software such as PostGreSQL/PostGIS. It is also supported by other major vendors such as IBM.

In this course, we will be working with ESRI's ArcGIS Geodatabase and PostGreSQL/PostGIS. There will be a series of assignments using these technologies. These will be provided via the course website and discussed in class.

Course Learning Objectives:
Upon completion of this course, students should be able to...
- Understand database design with spatial objects.
- Write spatial queries.
- Understand physical data storage and performance tuning.
- Understand spatio-temporal and moving objects data.
- Have practical GIS data skills.

Schedule: You can find the schedule as a Google Doc at this link: Schedule.

Textbook:
- There is no required textbook for this course.
- All readings and resources will be provided on the course website.
    - **B**: Bolstad, P. (2019). *GIS Fundamentals*, 6th edition.
    - **CM**: Coronel, C. & Morris, S. (2016). *Database Systems: Design, Implementation, and Management*, 12th edition.
    - **EN**: Elmasri, R. & Navathe, S. (2016). *Fundamentals of Database Systems*, 7th edition.
    - **N**: Nasser, H. (2014). *Learning ArcGIS Geodatabases*.
    - **OH**: Obe, R. & Hsu, L. (2015). *PostGIS in Action,* 2nd edition.
    - **R+**: Rigaux, P., Scholl, M., & Voisard, A. (2002). *Spatial Databases with Application to GIS*.
    - **RG**: Ramakrishnan, R. & Gehrke, J. (1999) *Database Management Systems*, 2nd edition.
    - **SC**: Shekhar, S. & Chawla, S. (2003) *Spatial Databases: A Tour*.
    - **WD**: Worboys, M. & Duckham, M. (2004) *GIS: A Computing Perspective*, 2nd edition.
    - **Z**: Zeiler, M. (2010) *Modeling Our World: The ESRI Guide to Geodatabase Concepts*, 2nd edition.

Evaluation:
- Labs: 48%
    - There will be 12 labs, and all labs will be counted toward your final grade in the course. No labs will be dropped.
    - Do not expect to complete all of your lab work during the scheduled lab time. You will need to dedicate time outside of class to completing your labs.
- Exams: 42%
    - There will be 3 exams, and your lowest exam grade will be dropped.
    - On exam days, you need to bring the following:

- **BuckID (or some other form of official photo identification)**. As an exam security measure, we will be confirming *everyone's* identity, even if we know your name and face.
- **#2 pencil**. You might also want to bring a good eraser.
- **One 3 in x 5 in (or smaller) index card.** This may be covered on front and back with whatever you wish. Cards may be confiscated at the instructor/TA's discretion (e.g. if card exceeds size limitation).

- Participation/Attendance: 10%
  - Attendance will be taken at all lecture meetings and lab meetings using a sign-in sheet. You must sign the sheet during the scheduled class time to be considered present. Failure to sign the sheet during the scheduled class time is considered an absence.
  - Attendance is worth 10 points in total. You are allowed 1 unexcused absence from lecture and 1 unexcused absence from lab without penalty. After this, every unexcused absence results in a -1 point deduction. No more than 10 points can be lost toward your attendance score.
  - Excused absences may be requested by contacting the instructor/TA. Decisions about excused absence requests are made at the discretion of the instructor/TA. It is highly recommended that documentation in support of the request is provided as soon as possible to expedite the decision-making process.

- *Grading Scale* (OSU standard scale):
  - A   93-100%
  - A-   90-92%
  - B+   87-89%
  - B   83-86%
  - B-   80-82%
  - C+   77-79%
  - C   73-76%
  - C-   70-72%
  - D+   67-69%
  - D   60-66%
  - E   0-59%

  Note: Your final grade as seen on the course website is rounded to the nearest whole number (e.g. an 89.49 is a B+ but an 89.50 is an A-). No other adjustment or curve will be applied. The letter grade that you see on the course website is what will be submitted to the registrar at the end of the semester.

Policies:

1. *Course correspondence policies.*
   a. Use the proper title when addressing your instructors/TAs. Recommended resource: What should I call my professor? For example: Because Emily S. Castellucci has a Ph.D., it's always Dr. Castellucci, *never* Ms., Mrs., or Miss.
   b. When emailing your instructors/TAs using OSU email, always include the course number and meeting time somewhere in the subject or body of the email. This information will help your instructor/TA respond more quickly.
   c. You are responsible for all announcements, assignments, and other material posted on Carmen. It is highly recommended that you review your Carmen Canvas notification settings each semester to ensure that you are receiving the information that you need to succeed.
   d. If you need help with lab assignments outside of class time, you should post your question(s) to the appropriate discussion on the course website. This is great

practice for posting in online forums for assistance when working on projects outside of class. Additionally, using discussion boards for lab questions helps us respond to questions in an efficient manner, so do not send your questions via OSU email or Carmen message, unless it is grade-related.

2. *Late policy*.
   a. You can submit assignments up to two weeks late, but the late penalty is 5% (of the total possible score) per day. The late penalty will not reduce grades to below 70% (of the total possible score). Late penalties are managed by the course website and automatically applied.
   b. Extensions are NOT typically granted due to getting "stuck," encountering unexpected errors, software crashes, lost work, inability to access the lab classrooms and/or Derby Hall, or other issues related to these. This is because these are realistic issues that you are likely to encounter when performing GIS work outside of this class, and you need to learn how to manage these issues when they arise. However, do keep in touch with your instructor/TA when issues arise so that we can provide support.

3. *Exam policies*.
   a. Make-up exams are allowed, but they may be classified as excused (no penalty) or unexcused (10% penalty), as deemed appropriate by the instructor.
   b. You are expected to arrive to all exams *on time*. If you arrive late, you might not be allowed to begin the exam, as deemed appropriate by the instructor.
   c. You are expected to finish all exams *on time*. Exams begin when scheduled class time begins, and exams end when the scheduled class time ends. At the end of the scheduled class time, you are to stop working and turn in your exam. You may not continue working on your exam after the scheduled class time.

4. *Disability services policy*. The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

5. *Academic integrity/misconduct policies*.
   a. It is the responsibility of the Committee on Academic Misconduct (COAM) to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct: http://studentlife.osu.edu/pdfs/csc_12-31-07.pdf.

      b. IMPORTANT: "Warnings" are not given due to an offense being one's first offense, due to ignorance of what constitutes academic misconduct, or due to any other circumstances. *All* instances of suspected misconduct must be reported.

      c. For specific academic integrity/misconduct information relevant to this course, see the Academic Integrity Supplement link under Modules > Course Information on the course website.

6. *Other policies.*

      a. If you are ill, please consider the health of your fellow classmates and your instructor/TA when deciding whether or not you should come to class. If you are displaying symptoms indicating that what you have may be contagious (e.g. fever, etc.), please do not come to class. Instead, notify your instructor of your illness and ask how you can make up the missed class.

      b. Practice your professionalism by ensuring that your work is free from spelling and grammatical errors. Such errors may be penalized at the discretion of the instructor/TA.

Student Support Services:

For information about student support services, see the Student Support Services link under Modules > Course Information on the course website.

Technology:

For information about software access, computer access, classroom access, and building access, see the Technology Access link under Modules > Labs on the course website.

Feedback:

If you'd like to make a suggestion for how this course could be improved for future semesters, please submit that suggestion in the Suggestion Box (Google Form). However, please keep in mind that form submissions are not likely to be viewed until after the semester has ended, so if your concern requires a timely response, please email your instructor and/or TA, as appropriate.

Disclaimer:

This course syllabus provides a general plan for the course; deviations may be necessary. Such deviations may be made for individuals or for the entire class, as deemed appropriate by the instructor. Any changes that affect the entire class will be announced by the instructor with as much advance notice as possible.

GEOG 5212 Geospatial Databases for GIS - Spring 2020

Schedule (original)

Key: DARK PURPLE indicates lecture, and LIGHT PURPLE indicates lab.
Remember: *Lab sections always meet, regardless of what is taking place during lecture.*

Date	Lecture	Reading*	Notes
Section 1: Introduction to Spatial Databases			
T 1/7	Course Overview Lecture 1 - Databases	CM Chapters 1 & 2 WD pp. 1-43	
R 1/9	Lab 1	Z Chapter 1	
T 1/14	Lecture 2 - Spatial Databases	SC Chapter 1	
R 1/16	Lab 2		**Lab 1 DUE @ 11:59pm**
F 1/17	**Self Introduction and Syllabus Quiz DUE @ 11:59pm**		
Section 2: Designing Spatial Databases			
T 1/21	Lecture 3 - Conceptual Data Modeling	CM Sections 9.3-9.4, 3.1-3.2, 3.6, 3.9, 4.1-4.2 WD pp. 43-45,55-65 SC Section 2.2	
R 1/23	Lab 3		**Lab 2 DUE @ 11:59pm**
T 1/28	Lecture 4 - Logical Data Modeling and Normalization	WD pp. 66-71 CM Sections 6.1-6.3, 6.6-6.9 B pp. 358-365	
R 1/30	Lab 4		**Lab 3 DUE @ 11:59pm**
T 2/4	Lecture 5 - Object-Orientation	CM Appendix G pp. 1-18, 28-34, 41-46 CM Appendix H WD pp. 71-80 SC Sections 2-3.2-4	
R 2/6	Lab 5		**Lab 4 DUE @ 11:59pm**
T 2/11	Lecture 6 - Spatial Fields and Spatial Objects	WD pp. 133-165	
R 2/13	Lab 6		**Lab 5 DUE @ 11:59pm**
T 2/18	**Exam 1** (This exam covers Lectures 1-6.)		
R 2/20	Lab 7		**Lab 6 DUE @ 11:59pm**
Section 3: Querying Spatial Databases			
T 2/25	Lecture 7 - Querying and Relational Algebra	B pp. 340-343	

		RG Chapter 4 (pp. 91-100 only)	
R 2/27	Lab 8		**Lab 7 DUE @ 11:59pm**
T 3/3	Lecture8 - SQL and Spatial Querying	CM Chapter 7 RG Chapter 5 (pp. 121-150 only) SC Chapter 3	
R 3/5	Lab 9		**Lab 8 DUE @ 11:59pm**
Section 4: Spatial Data Storage and Access			
T 3/17	Lecture 9 - Data Storage and File Structures	EN Chapter 16	
R 3/19	Lab 10		**Lab 9 DUE @ 11:59pm**
T 3/24	Lecture 10 - Non-Spatial Database Indices	WD pp. 225-229 EN Chapter 17	
R 3/26	Lab 11		**Lab 10 DUE @ 11:59pm**
T 3/31	Lecture 11 - Spatial Database Indexes - Part 1	WD pp. 229-239 RG Chapter 26 (pp. 777-786 only) R+ Section 6-6.1 SC Section 4.1.5	
R 4/2	Lab 12		**Lab 11 DUE @ 11:59pm**
T 4/7	Lecture 12 - Spatial Database Indexes - Part 2	WD pp. 240-258	
R 4/9			**Lab 12 DUE @ 11:59pm**
T 4/14	**Exam 2** (This exam covers Lectures 7-12.)		
Section 5: Architectures			
R 4/16	Lecture 13 - Architectures	WD pp. 259-291	**Final Deadline: Late Submissions DUE @ 11:59pm**
R 4/23	**Exam 3** (This exam covers Lectures 1-13.) The exam will be **2:00pm - 3:45pm** in our normal classroom.		

* The assigned reading helps you review the lecture.

Disclaimer: This course schedule provides a general plan for the course; deviations may be necessary. Any changes will be announced by the instructor with as much advance notice as possible.

Arts and Sciences Distance Learning Course Component Technical Review Checklist

Course: Geog 5212
Instructor: Emily S. Castellucci
Summary: Geospatial Databases For GIS

Standard - Course Technology	Yes	Yes with Revisions	No	Feedback/ Recomm.
6.1 The tools used in the course support the learning objectives and competencies.	X			• Office 365 • Carmen • ArcGIS • QGIS • RemoteLab • PostgreSQL • PostGIS • pgAdmin
6.2 Course tools promote learner engagement and active learning.	X			• CarmenZoom • CarmenWiki • Carmen Discussion Boards
6.3 Technologies required in the course are readily obtainable.	X			All tools are available via OSU site license free of charge.
6.4 The course technologies are current.	X			All are updated regularly.
6.5 Links are provided to privacy policies for all external tools required in the course.	X			Privacy polices for all 3rd party tools are included.
Standard - Learner Support				
7.1 The course instructions articulate or link to a clear description of the technical support offered and how to access it.	X			Links to 8HELP are provided
7.2 Course instructions articulate or link to the institution's accessibility policies and services.	X			a
7.3 Course instructions articulate or link to an explanation of how the institution's academic support services and resources can help learners succeed in the course and how learners can obtain them.	X			b
7.4 Course instructions articulate or link to an explanation of how the institution's student services and resources can help learners succeed and how learners can obtain them.	X			c
Standard – Accessibility and Usability				
8.1 Course navigation facilitates ease of use.	X			Recommend using the Carmen Distance Learning "Master Course" template developed by ODEE and available in the Canvas Commons to provide student-users with a consistent user experience in terms of navigation and access to course content.
8.2 Information is provided about the accessibility of all technologies required in the course.	X			Accessibility policies for all 3rd party tools are included.
8.3 The course provides alternative means of access to course materials in formats that meet the needs of diverse learners.	X			Instructions are provided to obtain materials in another format.
8.4 The course design facilitates readability	X			
8.5 Course multimedia facilitate ease of use.	X			All assignments and activities that use the Carmen LMS with embedded multimedia facilitates ease of use. All other multimedia resources facilitate ease of use by being available

				through a standard web browser

Reviewer Information
- Date reviewed: 7/13/20
- Reviewed by: Ian Anderson

Notes: This is ready to go!

[a]The following statement about disability services (recommended 16 point font): Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, slds@osu.edu; slds.osu.edu.

[b]Add to the syllabus this link with an overview and contact information for the student academic services offered on the OSU main campus. http://advising.osu.edu/welcome.shtml

[c]Add to the syllabus this link with an overview and contact information for student services offered on the OSU main campus. http://ssc.osu.edu. Also, consider including this link in the "Other Course Policies" section of the syllabus.