GEOG 5212 Geospatial Databases for GIS – Autumn 2019

Meeting Times:
Lecture/Lab: TR 11:10am-12:30pm, 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. My office hours are by appointment only. If you would like to schedule a meeting with me, please visit my scheduling website: https://emilycastellucci.clickbook.net/. If you cannot make your appointment, please cancel.

Teaching Assistant(s):

Name	*Email*	*Office Hours and Location*
Nicholas Kinyanjui	kinyanjui.3@osu.edu	TR, 2:30-3:30pm, Derby 1131 (or Derby 0135, if not in office)

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. (2016). *GIS Fundamentals*, 5th 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.
    - All lab assignments will be submitted via the course website in a quiz-like format. Because you only have one submission attempt, the questions will be provided to you in advance; you can find the questions at the end of each lab's instructions.

    - Some questions are automatically graded. The correct answers for these questions are available one week after the lab is due. Sometimes it may appear that your answer is correct but has been marked incorrect; please wait until the correct answers are released before making inquiries about such incidents.
    - Some questions require manual grading. If you do not receive full credit for a manually graded question, you can check for feedback/comments by going to Assignments on the course website, clicking on the assignment, and scrolling down until you see comment bubbles.
    - For your lab submissions, sometimes a specific file type (e.g. PDF, PPTX, etc.) is requested. Failure to submit the correct file type may incur a 50% penalty for that question.
- Exams: 42%
    - There will be 3 exams, and your lowest exam grade will be dropped.
    - Exams will be administered on the course website, during our regularly scheduled class time; you must be physically present to take the exams. Please bring your **BuckID (mandatory, see below)** and **one 3 in x 5 in index card (optional)**, covered on both sides with whatever you wish.
    - IMPORTANT: You MUST bring your BuckID! For all exams in this course, you are required to bring your BuckID, and every student's BuckID will be checked to confirm their identity. If you forget to bring your BuckID, you will not be allowed to begin the exam, and you will have to leave and request a make-up exam. (A make-up exam for this reason will be treated as unexcused and subject to a 15% penalty.) For the sake of fairness to all, there will be no exceptions for anyone who forgets their BuckID (or some other form of official photo identification, as deemed acceptable by the instructor/TA), even if we know your name/face.
    - Exams will not be returned to you. If you wish to review your exam, you will need to schedule a meeting with your instructor.
- Participation/Attendance: 10%
    - 0.5 points – Self Introduction
    - 0.5 points – Syllabus Quiz
    - 4 points – Attendance (lab)
        - Attendance will be taken at every lab meeting. You will not be penalized for your first unexcused absence. After your first unexcused absence, you will be penalized a half point per unexcused absence until a maximum deduction of 4 points has been reached. To request an excused absence, please email your instructor/TA with official documentation in support of your reason for an excused absence.
    - 5 points – Top Hat (lecture)
        - We'll be using Top Hat as an engagement tool during lecture, so be sure to bring a device that supports the Top Hat app. Here is a resource that will help you get started with Top Hat, if you are unfamiliar with it: https://resourcecenter.odee.osu.edu/top-hat/using-top-hat-students
        - A minimum Top Hat score of 50% is required to receive full credit on the Top Hat portion of your Participation/Attendance grade. Top Hat activities

CANNOT be made up for any reason, including excused absences. The low threshold of 50% is intended to accommodate this policy.

- *Grading Scale* (OSU standard scale):

A	93-100%	B-	80-82%	D+	67-69%
A-	90-92%	C+	77-79%	D	60-66%
B+	87-89%	C	73-76%	E	0-59%
B	83-86%	C-	70-72%		

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-).

Policies:

1. *Email correspondence policies.*
    a. You are responsible for all course related emails, so be sure to check your email frequently (i.e. daily on weekdays).
    b. When emailing your instructor at castellucci.5@osu.edu, always include the course number and meeting time somewhere in the subject or body of the email. (This is important since your instructor teaches multiple classes and needs to know to which class you are referring.)
    c. Do not contact your instructor via the Canvas Inbox/Conversations messaging system. You will not receive a response.
2. *Course website policy.* You are responsible for all announcements, additional reading, assignments and other material posted at the Canvas site, so be sure to check it frequently (i.e. daily on weekdays).
    a. You may find that it helps to update your email notifications. You can do this by going to Account > Notifications. For more information check out this help website: https://community.canvaslms.com/docs/doc-10624.
    b. There is a Canvas app available for iPhone and Android, which you may find beneficial for keeping up with the course website.
3. *Lab questions policies*.
    a. On the course website, there will be a discussion for each lab. If you have questions about labs outside of the scheduled lab time, you are required to use the appropriate discussion to post your questions. Your instructor and TA will be notified of your post and will respond as soon as possible. Please do NOT email your lab-related question to your instructor or TA, unless it is a grade-related question.
    b. Additionally, please post your lab-related question as least 24 hours before the day/time the lab is due to allow your instructor and TA time to respond.
4. *Late policies*.
    a. All assignments, except Exams and Top Hat, are accepted late, until the final submission deadline listed in the course schedule.
    b. The late penalty is 5% per day late and is managed and automatically applied by the course website. The number of days late is rounded to the next whole number, e.g. 1.5 days late is considered 2 days late. A maximum penalty of 30%

will be reached at 6 days late, and the late penalty will not get any worse after that point.

c. Extensions will NOT be granted due to lost work, software crashes, or inability to access the lab classrooms and/or Derby Hall.
d. Tip: Sometimes it is better to accept a small point deduction for a little extra time to work on your lab than to submit incomplete or rushed results.

5. *Exam policies*.
    a. Any exam not taken with the rest of the class at the designated date, time, and location is considered a make-up exam. The reason for the make-up exam determines whether it is excused (not penalized) or unexcused (penalized 15%).
    b. You are expected to arrive to all exams *on time*. If you are more than 15 minutes late, you will have to leave and contact the instructor to schedule a make-up exam. The reason for your tardiness will determine if the make-up exam is excused or unexcused.
    c. You are expected to finish all exams *on time*. Exams begin when schedule 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.
6. *BuckeyePass policy*.
    a. BuckeyePass is required for Carmen access. Any problem with accessing our course website, course materials, etc. due to issues involving BuckeyePass will not be excused or accommodated.
    b. You should already be registered for BuckeyePass, as it is necessary to register for classes and pay tuition and fees. However, just in case you are not yet registered or just in case you would like to add an additional authentication device, you should be able to do so at buckeyepass.osu.edu. (It is recommended that you register more than one device as a backup in case you lose or forget your primary device.)
7. *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.
8. *Academic misconduct policy*. 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.

a. Avoid plagiarism! All open-ended responses to questions, prompts, etc. must be written entirely, nearly entirely, or at least in majority using your own words. Use credible sources, and cite all sources, including those only referenced, those indirectly paraphrased, and those directly quoted, being sure to use quotation marks to identify excerpts from these credible sources. This expectation to cite all of your sources also extends to the textbook, the lab instructions, the lecture slides, other course materials, online resources, etc. Failure to avoid plagiarism will require the instructor/TA to submit a report to COAM.
b. Protect your work! You are strongly encouraged to use cloud storage to back up your files and strongly *dis*couraged against using portable devices (e.g. flash drives) to back up your files, because portable devices are easily lost/stolen. Failure to make your work secure and inaccessible to other students presents data security and academic integrity concerns.
    i. If your work is discovered to be unsecured and accessible to other students, you will be penalized on each affected assignment. The severity of the penalty will be determined at the instructor's discretion.
    ii. Regardless of the means of access, if another student accesses your work and uses it is as their own, both of you may receive zeros for the assignment and both of you may be held responsible for academic misconduct.
    iii. Portable devices are easily and frequently forgotten in the lab classrooms. If you find forgotten portable device, please do not leave it. Instead, give the device to your TA or instructor, who will attempt to identify the owner and keep the device safe until it is returned to its owner. Any devices left unclaimed by the date/time grades are due for the current semester will become property of the TA or instructor.
c. Submit your own work! Collaboration for the purposes of troubleshooting is highly encouraged in this course, but everyone is expected to submit their own unique work. For example, asking a classmate how to resolve an unexpected error message is OK, but using another classmate's work as your own is NOT ok, regardless of whether or not they provide consent for the use of their materials. There are many other acceptable/unacceptable actions than those exemplified here, so if you have any questions or concerns about acceptable/unacceptable actions, ask your instructor for clarification/permission.

9. *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.
    b. Ensure that your work is free from spelling and grammatical errors. Such errors may be penalized at the discretion of the instructor/TA.

Computer Access:

Here are some tips for using the computers in Derby 135 and 140:

- OSU name.# credentials. Use your OSU name.# credentials to log into the computers in Derby 135 and 140.
- Enter your password carefully. If you enter the wrong password too many times, you will get locked out of your account. To have the lock removed, you will have to call 8-help at 614-688-4357.
- Back up your files. Student profiles and all the data saved with these profiles may be erased without warning. Therefore, you are encouraged to back up everything. Only YOU are responsible for files left on lab machines, not the instructor, TA, or anyone else.
- LOG OUT before you leave. If you forget to log out, you will be leaving your work and other sensitive information unsecured and accessible to others.
- Use the same computer. It will take a few minutes to log into a computer if it is the first time you are logging into that particular computer. The next time you attempt to log into the same computer, it will be much faster. It may not always be possible to use the exact same computer, but you are encouraged to do so whenever you can.
- Report problems. If a computer is having problems, send an email to asctech@osu.edu. Be sure to include the building name, the classroom number, the computer ID number (visible on a sticker on the CPU), and a description of the problem.

Classroom Access:

Here are instructions for accessing classroom schedules for Derby 135 and 140:

- Check the Room Matrix:
- https://delegated.osu.edu/psp/csosuda_1/EMPLOYEE/CAMP/c/OSR_CUSTOM_MENU.OSR_ROOM_MATRIX.GBL
    - Enter DB0135 for Derby 135 or DB0140 for Derby 140.
    - Select the date under “Show Week of”.
    - Click “Refresh Calendar”.
- You should be able to see when the classroom is available/unavailable.

IMPORTANT: Sometimes students attempt to work in these classrooms while other classes are in session. This is fine, as long as you have permission from the instructor or TA of the other class to stay and work. The instructor/TA may provide their permission explicitly, by telling you that you are allowed to stay, or implicitly, by leaving you alone while they conduct their class. However, even if you usually have permission to stay and work in a classroom while another class is taking place, you should not rely on this. The instructor/TA has every right to ask you to leave when their class is in session, and they are not required to provide you with any reason or warning that the classroom will not be available on a particular day or at a particular time. Any amount of time that you are allowed to work in a classroom, during a class session that you are not registered to attend, is a generosity of the instructor/TA and should be respected.

Building Access:

You should have 24/7 access to Derby Hall and to rooms 135 and 140 in Derby Hall by swiping your OSU BuckID. However, DO NOT take it for granted that you have 24/7 access. If you find

that you are having trouble with your swipe access, you will need to request help from the staff in the geography main office (Derby 1036). Additionally, do NOT lock yourself out of the classroom or the building! It is not the responsibility of the instructor or TA to give you access to the building or the classroom outside of class time.

Software Access:

The software that you will need for this course is already available on the computers in Derby Hall 135 and 140, and you are NOT required to download the software onto your own computer. However, information on accessing ArcGIS Pro and QGIS on your own computer is provided here.

1) *ArcGIS Pro*. For detailed instructions, visit Getting Started with ArcGIS Pro at Ohio State (BuckeyeBox account required for access).
    a. Your instructor and TA are NOT responsible for answering your installation-related questions. If you need help, you will need to contact esri-support@osu.edu.
    b. Please note that ArcGIS Pro only runs on certain Windows operating systems, so if you only have access to a computer with a Mac operating system, you will have to use the computers in Derby Hall 135 and 140 to complete your course assignments.
    c. IMPORTANT: ArcGIS Pro is *not* the same thing as ArcGIS Online or the ArcGIS Desktop suite. You *must* use ArcGIS Pro in this course. Attempting to complete the labs using ArcGIS Online or the ArcGIS Desktop apps (e.g. ArcMap) will *not* work!
2) *QGIS.* You can find the software by visiting http://qgis.org/en/site/.
    a. Your instructor and TA are NOT responsible for answering your installation-related questions. You will need to troubleshoot such issues yourself.
    b. Unlike ArcGIS Pro, QGIS can operate on the Mac operating system and other operating systems.
3) PostgreSQL, PostGIS, and pgAdmin.
    a. You can download and install PostgreSQL and PostGIS from this site: https://www.postgresql.org/download/.
        i. 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.
        ii. Additionally, remember to record any passwords and port numbers that you create during the installation process. You'll need this information!
    b. You can download and install pgAdmin from this site: https://www.pgadmin.org/download/.
    c. Your instructor and TA are NOT responsible for answering your installation-related questions. You will need to troubleshoot such issues yourself.

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. Any changes will be announced by the instructor with as much advance notice as possible.