

GEOG 5210 Geospatial Databases for GIS – Spring 2019

Meeting Times:

Lecture/Lab: MW 11:10am-12:25pm, Derby Hall 140

OR

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. 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.

Note: I am not available for meetings on Fridays, so please plan accordingly.

Teaching Assistant(s):

<i>Name</i>	<i>Email</i>	<i>Office Hours and Location</i>
Rebecca Chapman	chapman.751@osu.edu	M 12:30-2pm, Derby Hall 1155

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 this technology. These will be provided via the course website and discussed in class.

Learning Objectives: After successful completion of this course, you should:

1. Understand database design with spatial objects,
2. Be able to write spatial queries,
3. Understand physical data storage and performance tuning,
4. Understand spatio-temporal and moving objects data, and
5. 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.
 - Each exam contains approximately 50 questions, and correctly answering all questions is required to make a 100% on the exam.
 - To each exam, you may bring one 3 in x 5 in index card, covered on both sides with whatever you wish.
 - 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%
 - 1 point – Self Introduction
 - 2 points – Syllabus Quiz
 - 7 points – Attendance
 - Attendance is required and will be recorded at all lecture and lab meetings. An attendance sheet will be passed around the classroom, and you are responsible for remembering to sign it. If you forget to sign the attendance sheet during the scheduled class time, you will be marked absent (unexcused).
 - Unexcused Absences:
 - You are allowed only 1 unexcused absences from lecture sessions and 1 unexcused absence from lab sessions without penalty.
 - Additional unexcused absences will result in a full point (-1) deduction from your attendance grade. No more than 7 points total can be lost from attendance.
 - Excused Absences:
 - Requests for excused absences (e.g. due to illness, car trouble, conference attendance, required job training, death of a loved one, etc.) require completion of the [Request for Excused Absence Form](#). Please do *not* email your instructor or TA to request an excused absence!
 - Your submission of the form, along with accompanying documentation (e.g. doctor's note, bill from a mechanic, proof of conference registration, email from a supervisor, obituary, etc.),

may not be reviewed immediately, but you may assume that your absence is excused, unless you hear otherwise from your instructor.

- Please note that absences due to oversleeping, getting stuck in traffic, and going on vacation are not excused, and there may be other reasons for an absence that are also not excusable, as judged by the instructor.
- Finally, keep in mind that you may submit the request for an excused absence after the absence has taken place, if necessary.
- In order to comply with Federal Title IV regulations, The Ohio State University collects information regarding whether a student begins attending or participating in class at the beginning of the semester. To provide evidence of attendance/participation in this course, you will need to complete **at least one** of the following activities by Friday of the first week of classes:
 - sign the attendance sheet during class,
 - complete the Self Introduction, **or**
 - complete the Syllabus Quiz.
- *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 will be rounded to the nearest whole number (e.g. an 89.49 is a B+ but an 89.50 is an A-) before being submitted to the University Registrar at the end of the semester.

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 notifications. You can do this by going to Account > Notifications.
 - i. There are four notification options, and I suggest that you turn on “Notify me right away” or at least “Send daily summary” for everything until you figure out which notifications are most beneficial to you.

- ii. Important: You may need to make sure your email address is confirmed to receive notifications! If you are NOT receiving notifications in your email, despite updating your notification settings, here is what you need to do:
 1. Go to Account > Settings.
 2. Near the top right, you'll see your email address listed, but if there is an exclamation point ("!") next to your email address, hover your mouse over it, and it'll say something along the lines of "This email address has not been confirmed." This is why you're not getting notifications in your email.
 3. To confirm your email address, you need to either click the exclamation point or the email address itself, and a window should pop up, prompting you to click a link that will send a confirmation email. Click the link to send the confirmation email.
 4. Check your OSU email account for the confirmation message, and the link provided in the email to confirm the registration. After that, you should be good to! You should never have to do this again.
 - 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 course assignments, other than assignments in the labs category, will not be accepted late.
 - b. Late submissions will be penalized 1 points for each day late, up to 6 days (including weekends, holidays, etc.). After 6 days, late submissions will still be accepted through the date listed in the schedule, but the late penalty will not exceed 6 points.
 - c. The late penalty begins *immediately* following the deadline. For example, for an assignment due at Mondays at 11:59pm, submitting on Tuesday at 12:00am incurs a 1 point penalty.
 - 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.
 - e. It is possible for the late penalty to exceed the number of points awarded for correct answers, but a zero (not a negative number) will be assigned in these cases.)

- f. Extensions will NOT be granted due to lost work, software crashes, or inability to access the lab classrooms and/or Derby Hall.
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 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.
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: slids@osu.edu; 614-292-3307; slids.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 *discouraged* 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 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.

Computers, Classrooms, and Building:

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.

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](https://delegated.osu.edu/psp/csosuda_1/EMPLOYEE/CAMP/c/OSR_CUSTOM_MENU.OSR_ROOM_MATRIX.GBL)

1. Enter DB0135 for Derby 135 or DB0140 for Derby 140.
2. Select the date under "Show Week of".
3. Click "Refresh Calendar".

You should be able to see when the classroom is available/unavailable.

Here is what you need to know about 24/7 access to Derby Hall:

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:

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.

- 1) *ArcGIS for Desktop*. You may request a 1-year student trial license from your TA. Just email your TA, and your TA will send you an activation code. You will then need to activate the code and download the software here: http://www.esri.com/software/landing_pages/arcgis/desktop-ed. (If you want your version to match the version used on the lab computers this semester, you'll want to choose 10.6.) If you have any installation-related questions, you'll want to contact ESRI Customer Service at 1 (888) 377 – 4575.

Please note that ArcGIS for Desktop is NOT certified or supported on the Mac operating system. However, if you have an Apple computer running Windows, you can install ArcGIS for Desktop using VMWare, BootCamp, or Parallels. To learn more, please visit this link: <http://edcommunity.esri.com/software-and-data/mac-os-support>.

- 2) *Other software*. If you choose to install any other software that we are using in this course onto your personal machine, your instructor and TA are NOT responsible for answering your installation-related questions. You will need to troubleshoot such issues yourself.

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.