GEOG 5212 Geospatial Databases for GIS – Autumn 2018

Meeting Times: Wednesdays and Fridays, 11:10am – 12:30pm, Derby 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 Name and Email: Rebecca Chapman, chapman.751@osu.edu
Office Hours and Location: Fridays, 12:30-2:30pm, 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 a link to the schedule on the course website.

Materials:

- 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.
- Portable Memory Device:
  - You need to bring a portable memory device, such a flash drive or external hard drive, with you to every lab session, and all of your work needs to be saved to this flash drive.
  - Do NOT leave any of your work saved to the lab computers, which use class accounts and are not secure, and do NOT forget to take your portable memory device with you when you leave. Failure to make your work inaccessible to other students presents data security and academic integrity concerns. For more information, see the Academic Misconduct section under Policies.
  - A device with at least 8 GB of storage should be more than sufficient for the needs of this course.

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.
    - Labs will be due according to the deadlines listed in the course schedule, which correspond to the due dates listed on the course website.
    - 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 – Hello My Name Is Survey
    - 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 absence 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.
- *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. Please note that your instructor prefers to be emailed at castellucci.5@osu.edu, NOT via the Canvas Inbox/Conversations messaging system.
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). Note:
    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. Ater 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 point for each business day late, up to 10 business days. After 10 business days, late submissions will still be accepted through the date listed in the schedule, but the late penalty will not exceed 10 points. For example, for submissions due on Fridays at 11:10am, the late penalty technically begins Friday at 11:11am.
        i. Submitted by 11:11am Friday or earlier - on time
        ii. Submitted 11:11am Friday – 11:10am Monday - 1 point deduction
        iii. Submitted 11:11am Monday – 11:10am Tuesday - 2 point deduction
        iv. Submitted 11:11am Tuesday – 11:10am Wednesday - 3 point deduction
        v. Submitted 11:11am Wednesday – 11:10am Thursday - 4 points deduction

vi. Submitted 11:11am Thursday – 11:10am Friday - 5 points deduction
vii. Etc.

c. 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. (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.)
d. Extensions will NOT be granted due to lost work; be sure you back up and keep all of your work.

5. *Exam policies*.
   a. Exams must be taken at the scheduled time, unless you have submitted the Request for Excused Absence Form, and it has been approved by the instructor. Please contact your instructor in advance of the scheduled exam to schedule a make-up exam, except in the case of emergency.
   b. You are expected to arrive to all exams *on time*. Students who arrive late to the exam will be permitted to begin the exam, until the first student leaves. After a student completes the exam and leaves, students who arrive late will not be permitted to begin the exam, will be asked to leave, and will be considered absent. Your absence will be considered unexcused, unless you submit a Request for Excused Absence Form, and it is approved by the instructor.
   c. Make-up exam penalties:
      i. Make-up exams for excused absences will not be penalized.
      ii. Make-up exams for unexcused absences will be penalized 15%.
   d. 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. *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.
7. *Academic misconduct policy*. It is the responsibility of the Committee on Academic Misconduct 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. 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 (e.g. screen captures, etc.) as your own is NOT ok, regardless of whether or not they provide consent for the use of their materials. (Note: There are many other acceptable/unacceptable actions than those exemplified here.) If you have any questions or concerns about acceptable/unacceptable actions, ask your instructor for clarification/permission.
b. Do NOT leave any of your work saved to the lab computers, which use class accounts and are not secure, and do NOT forget to take your portable memory device with you when you leave. Failure to make your work inaccessible to other students presents data security and academic integrity concerns.
    i. 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.
    ii. If you leave your work (for any assignment, in part or on whole) on the lab computer or on a forgotten portable memory device and if an instructor or TA discovers this work, you will be penalized on each assignment that you made accessible to others by leaving your work unsecured. The severity of the penalty will be determined at the instructor's discretion. Additionally, any files saved on the lab computers will be deleted so that they will not be available to anyone else. (Files whose owners cannot be determined will also be deleted.)
    iii. Do your part to promote a culture of academic integrity:
        1. If you discover work that was left on the lab computers by another student, do not use the files. Please delete the files so that they will not be available to you or anyone else. (You may also delete files who owners cannot be determined.)
        2. If you discover a forgotten portable memory device, do not use the files stored on the device, and please do not allow the device to sit around the classroom unattended. Please give the device to your 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 instructor.
        3. If you suspect another student of suspicious behavior, please notify your instructor via a private email message.
c. 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, lecture slides, other

course materials, online resources, etc. Additionally, ensure that your work is free from spelling and grammatical errors. Such errors may be penalized at the discretion of the instructor/TA.

Classroom and Computers:

To access the computers in Derby 0135 and 0140, you may use the following login information:

- Username: G5212
- Password: Geog-5212AU18

To access the internet, you need to visit the following website and login:
https://nauth1.auth.infosec.ohio-state.edu

If you need to return to the computer lab outside of class time, consider whether you are returning during or before/after regular business hours (Monday – Friday, 8am – 5pm)

- During regular business hours,
  - Be aware that there may be a class in session, and please avoid interrupting classes that are in session.
  - If there is a class in session, check the other computer lab across the hall. Derby 135 and 140 have the same software.
- Before/after regular business hours,
  - Please be aware that the building is usually locked at night, over weekends, and on holidays, so be sure to plan accordingly.
  - If you need more exact information about building hours/availability, please ask the staff in the geography department's main office in Derby 1036.
  - You may need to scan your BuckID to access Derby 135 and 140, so be sure to take it with you.
  - The card scanners are sometimes unreliable. You may need to swipe more than once, and you may need to wait a second or two after swiping to open the door, giving the scanner a chance to unlock the door.
  - If you have problems accessing Derby 135 and 140 with your BuckID, please notify the office staff in Derby 1036
  - Warning: 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.

If you would like to check the schedules for Derby 135 and 140, you can check the Room Matrix:
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 will be able to see when the room is occupied and when the room is available.

Software:
You are NOT required to download the software we will be using in the course 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.)

   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.