University of Texas at El Paso
School of Sciences
Department of Earth, Environmental and Resource Sciences

GEOL4385 INTRODUCTION TO GIS
GEOL5321 INTRODUCTION TO GIST
FALL 2021 Syllabus

Instructor Information

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Office Hours- Prof. Alvarez (zoom): TF 11:00 AM – 12:00 PM
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Learning Management Site: Blackboard

Course Description

This course is an introduction to Geographic Information Science and Technology (GIST). Geographic Information Systems (GIS) are tools for integrating and analyzing spatial data to visualize relationships, seek explanations, and develop solutions to real world problems. The foundations and theory of GIS will be emphasized in relation to its applicability and use in the sciences and other fields. Students will demonstrate knowledge about the history of GIS, acquisition of data, data quality and ethics, data classification, mapping, interpretation and analysis, applications of GIS, GIS data models, data visualization, and basic interpolation, among others. The course includes a lab component in which all students will have access to computers with the Environmental Systems Research Institute (ESRI) ArcGIS Pro Desktop software. In the lab, students will perform a variety of problem-solving tasks that connect with concepts covered in the lecture. Other key skills practiced in lectures and/or labs include: connecting hands-on GIS work to GIS theory,

written communication, planning and organization, and interpersonal communication.

Learning Outcomes/Course Objectives

Students successfully completing this introductory GIS course will be able to:
- Independently acquire, create, and edit spatial data for use with GIS.
- Understand the fundamentals of GIS data models and data structures and be able to use that knowledge to select the best approach for solving particular geographic problems.
- Have sufficient technical skills to apply GIS towards solutions for various geographic problems.
- Be able to successfully organize, manage, and present results in the form of a GIS project.
- Have sufficient knowledge to take further GIS courses offered by the GIS certificate program.

Course Materials

We strongly suggest students get the textbook listed below:

Price, Maribeth; 2018*. Mastering ArcGIS Pro. McGraw Hill, 436 pp.*

The class materials, including lecture presentations and laboratory handouts, can be found on blackboard. Other readings will be provided through Blackboard.

Additional Textbook References (not required)

- Longley, P., Goodchild, M., Maguire, D., Rhind, D. (2015). *Geographic Information Science and Systems*. Wiley. 477 pp.
- Post, C., Esswein, S., Mikhailova, E., Ritter, B., 2018*. GIS Exercises for Natural Resource Management. Fifth Edition.*
- Bolstad, 2019. *GIS Fundamentals. 6th Edition. XanEdu Editorial.*
- Chang, K-S, 2016*. Introduction to Geographic Information Systems. 9th edition. McGraw Hill, 444 pp.*

Data Handling and Lab Submission

- Students are encouraged to complete their laboratory assignments in the SEGA Lab where everybody will have extra-class, full access to the room (using the last six digits of your ID number, i.e. after the 80), computers and licensed ArcGIS Pro software. Students can also use provisional data storage in the machines they select to work or network folder.
- It is also recommended to save your progress into a portable USB drive as machines get wiped out regularly.
- The Lab submission will be (1) a PDF document with answers and (2) a .zip file with the output files produced during the Lab exercise. The lab submissions will occur through Blackboard according to the deadlines indicated in the course schedule.

Course Structure

The format of the course will be lectures, short in-class assignments for participation, midterm exam, lab sessions and a long term project. Students will gain hands-on experience using ESRI ArcGIS Pro software, one of the most widely used commercial GIS packages. However, knowledge gained during the theoretical and practical sessions will easily be transferable to other platforms like QGIS or GRASS.

Lectures: The lecture section will not be limited to instructor-led discussions. To help students gain a better insight into GIS and GIST, the lecture session will also include additional time for application demonstrations, in-class exercises, and more. The instructor expects students to attend lectures and only work on course related materials during that time. Attendance will be taken every class and lab meeting, and a total of 2% of the class grade may be earned at the end of the Semester, to encourage and reward students that always attended to lectures and labs. Participation is an essential part of the course and will be assessed based on in-class activities. A total of 3% will be awarded to students that participate during the in-class questions (at least once during the semester). Please use this active learning strategy as it is designed to enhance your learning and provide you with an opportunity for reflection, elaboration, and/or application.

Lab Exercises: The GIS lab is an important component of GIS training that provides students with hands-on experience in GIS, in order to consolidate their understanding of basic GIS theoretical concepts and analytical techniques. ESRI's ArcGIS Pro and ArcGIS Online are the primary software tools that will be utilized in implementing various spatial data analytical techniques and methods. Students will be introduced to other related software during the course of the semester, including Google Earth and some open source software. A total of ten (10) mandatory labs and one (1) bonus (extra-credit, worth 6%) Lab will be completed, and additional details will be provided during the first meetings. Most lab work coincides with skills and concepts learned in lecture and readings. It is therefore vital for students to attend class so that they understand assigned exercises and complete them on time. You will have time to complete most of lab assignments during scheduled class meetings, but some will require time outside of class. Lab assignments must be turned in via Blackboard by the due date specified in the lab document, and the submitted assignment must be your own work. Work must be submitted in the form of (1) a PDF attachment and (2) a .zip file, under the "Assignments" section of Blackboard. You should use your class time devoted to GIS lab activities wisely and you should not expect to leave class early. You are welcome to ask the Instructor or course Teaching Assistant (TA) for help outside of class, as long as you are making an effort to work while in class. Do not expect to miss lab time and to get extra outside class help to compensate.

Mid Term Exam: There will be one in-class midterm exam. The exam will be a combination of multiple choice, definition, short essay, and lab application questions. Questions will be based off the lectures, readings, and completed labs. Graduate students will receive an additional open-type of question during the exam.
There will be no final exam during finals week. Instead, you will complete, present, and turn in your final project report.

Long-Term Project: Students will complete one individual GIS project that is due at the end of the semester (final version). You are free to choose a project based on

a mutually agreed topic of interest. The project builds on skills and concepts learned throughout the entire course but certain components (such as project "outline" and identified data sources") will be due first (i.e. first phase; see the course schedule for due dates). Although class time is allotted for this project, students should expect to invest additional time, especially for data collection, the project final poster presentation and write-up. More specific details on the project guidelines will be provided in class. Students should expect to spend time outside of scheduled hours to complete the course project. You are expected to use a minimum of 5 GIS layers in their analysis, but graduate students are expected to come up with more rigorous projects involving 6 data layers or more and a clear science question for a paper-style work. More details will be provided soon but start thinking of a topic you would like to research. Graduate students are welcome to use data from your own research, if you like. The final project will assess the student's ability to complete a simulated consultancy project, comparable to what a GIS analyst will see working in the field.

Due Dates

Lab Exercises: In this course, there is an absolute due date for completing each of your lab assignments which will be indicated on the lab handouts. The reason for this is that each lab conceptually builds on previous labs, so it is important that students do not fall behind the schedule. If you do, you may find it hard to catch up. Labs must be submitted on time and to the correct blackboard assignment location to be considered for grading. We expect students to plan ahead, even factoring in any travel such as weddings, conferences, etc, that you might encounter during the semester. We also encourage students to start working on labs well in advance of the assigned deadline. Note, we will not make any exceptions to this policy for any student, unless there is a documented extenuating circumstance. Please plan ahead using the course schedule at the end of this syllabus, and deadlines as posted on Blackboard.

Long-term Project: Each of the two phases of the final project will have an assigned in-class due date. The first phase will be worth 4% of the total course grade. The second phase, 16%. Similar to the information above, note that late final project assignments will be accepted for 30% reduction, if turned in one day late; afterwards late final projects will not be accepted for any reason after the assigned due date.

Computer Skills and GIS Software

Instruction in using ArcGIS Pro and ArcGIS Online software will be provided during the lab sessions, but students taking this class are expected to have basic competence in the Windows operating system as well as Microsoft Excel, Power Point, and Word. Students should take initiative to learn additional details about these software applications so that they can solve problems as they arise. If you need help with computer skills, you should seek assistance at the Liberal Arts Center for Instructional Technology (LACIT) (Liberal Arts Building, Room 405, Tel. (915) 747-5375. LACIT staff provides workshops open to all students Fridays in Room 405 at the Liberal Arts Building. To attend just bring your current UTEP ID. If you plan to attend you should call LACIT beforehand to receive confirmation. Email the Instructor if you would like a one-year ArcGIS software student license for installation on your

personal computer for your own convenience, but note that it is your responsibility to make sure that your personal computer meets the required minimum software specifications.

Rules and Policies

Notes and Lectures: Any notes, labs, or lecture materials or for personal use only, and their sale or distribution to people outside the class is not permitted.

Blackboard Course Management System and Email Communication: This class uses Blackboard learning platform that you can access through your my.utep.edu portal (use your e-mail address and password to sign in). For this class all communication will be via the regular UTEP email system, so avoid using the Blackboard email function. As a requirement of this class, you must regularly check your UTEP email for posts that include announcements and personal messages to students. You are responsible for reading all your emails, so not having seen or read an email containing important course-related announcements will not be an acceptable excuse for failure to complete assignments on time, unless there is a verifiable technical issue. Please do not use your private email addresses for course-related communication.

Late and Missing Work, and Extra Credit: Late laboratory work submissions are accepted but 20% of the total grade will be deducted for each day after an assignment deadline. Make-up assignments or late submissions can only be allowed in the event of a documented medical or family emergency. If you do encounter an emergency, you must notify me on or before the day of the assignment or exam due date. Documentation could include a note from a physician, hospital admittance slip, or correspondence from an academic advisor or the Dean of Students. Foreseeable excused absences such as participation in university-sanctioned athletic or academic events also require documentation as well as notifying the Instructor at least one week in advance. In the case of foreseeable absences, you must turn in work early rather than late. In each of these situations it is the student's responsibility to communicate and keep the instructor informed. One extra credit assignment (Lab#1) will be available at the beginning of the semester (for additional 6% grade). No final grade adjustments will be made other than the opportunity to submit the optional Lab #1 at the start of the course (see course schedule).

Academic Honesty: Academic honesty is fundamental to the activities and principles of the University. Students are encouraged to share ideas, but you must do your own work (except in the case of collaborative group assignments). Cheating, plagiarism, and collusion, for example, will not be tolerated. Academic dishonesty has grave consequences that range from probation, expulsion, and failing the course. If you are found to be cheating, plagiarizing, or colluding, you will be subject to disciplinary action per UTEP catalog policy. Refer to http://sa.utep.edu/osccr/academic-integrity/ for further information.

Cell Phone Policy: Cell phones are not permitted for use at any time during this class. Taking calls, texting, taking pictures, or recording video during class is strictly prohibited. Any attempt to use a cell phone during class or lab will be seen as an attempt to cheat and subject to the policies defined in the UTEP Academic Misconduct Code.

Students with Disabilities: UTEP is committed to equity in the provision of educational services to students with disabilities. If you have (or suspect you have) a disability that requires accommodations or may affect your performance in this course, tell the professor so that we can work with the Center for Accommodations and Support Services (CASS) to meet your needs. You can contact CASS at (915) 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

Help with Writing: The University Writing Center (UWC) (Library Building, 2nd [ground] floor, Room 227 [adjacent to the Collaborative Learning Center], Tel. 747-5112) provides walk-in assistance with writing to all UTEP students at no cost. If you struggle with writing, the tutors at the UWC can help you! Check the website – http://uwc.utep.edu/ for a tutoring schedule.

Religious Absence: It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. Students who anticipate being absent from class due to the observation of major religious activity must provide written notice of the dates to the instructor by the second week of the semester.

COVID-19 PRECAUTION STATEMENT

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID-19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

Grading

Description	No	Value
Laboratory Assignments	10	6 % each for **60%** total (Lab #1 is optional submission for an additional 6% extra-credit)
Mid Term Exam	1	**15%**
Class Attendance and Participation	Cont	**5%** (2% for not missing any class, 3% for weekly in-class participation)
Long Term Project	1	**20%** (4% for 1st phase submission, 16% to 2nd phase submission)

Final grade table

Percent grades will be rounded to one decimal place and letter grades will have the following equivalence. Note, beyond this table, we will not round grades anymore for any reason so please do not ask. It is not fair to students who legitimately earned the same grade. Please use the extra-credit Lab#1 to improve your grades:

Letter Grade	Grade Point	Percentage
A	4.0	89.5 to 100
B	3.3	79.5 to 89.4
C	2.0	69.5 to 79.4
D	1.0	59.5 to 69.4
F	0.0	59.4 to 0

Course syllabus

This schedule is intended to keep you on pace to finish by the due dates. Due Dates will be noted on each assignment handout. Try not to fall behind this schedule; if you do, it may be difficult to catch up! Additionally, if you keep up with the assignments, you'll have more time to focus on the final project at the end of the semester, or any other classes you may have.

Week	Date	Topic	Reading	Assignment
1	23 Aug (M)	**Lecture #1: Introduction, syllabus and logistics. What is GIS?** History, scope, trends, professional use, project management, Web GIS. Map representation, scale, data sources, data quality, *ArcGIS overview, project, interface, tools and geoprocessing.* **Rules of Long-Term Project.**	Intro. Ch. 1	
	25 Aug (W)	**Lab #1: What is GIS?** Exploring on ArcGIS Pro project, Navigating 2D and 3D maps, using the help, managing windows, exploring project resources, setting map symbols, working with local GIS data, using ArcGIS online content, using geoprocessing.	Ch. 1	
2	30 Aug (M)	**Lecture #2: Mapping GIS data.** Choosing symbols for maps, types of data and types of maps, displaying rasters, classifying numerical data, *layers, styles*.	Ch. 2	

Week	Date	Topic	Reading	Assignment
	1 Sep (W)	**Lab #2: Mapping GIS data**. Setting basic symbols, labeling features, creating maps from attributes for points, editing legend details, creating maps for attributes of polygons, classifying data, displaying thematic rasters.	Ch. 2	Lab 1 due by 1 PM MT (bonus exercise)
3	6 Sep (M)	**Labor Day – No class – University closed**		
	8 Sep (W)	**Lecture #3: Presenting GIS data.** Determine map objective, select the data, arrange the map elements, symbolize the data, review the draft, edit and improve, *maps in ArcGIS, assigning map scales, setting up scale bars, labeling, text and annotation*.	Ch. 3	
4	13 Sep (M)	**Lab #3: Presenting GIS data**. Setting up the map page, creating a location map, using graphic text on layouts, working with dynamic labels, adding a legend to the map, placing a scale bar on the map, adding more map elements, reviewing and editing the layout, exporting a layout.	Ch. 3	Lab 2 due by 1 PM MT
	15 Sep (W)	**Lecture #4: Coordinate Systems.** Standard coordinate systems, geographic coordinate systems, map projections, choosing projections, impact of coordinate systems, *on-the-fly projection, labeling coordinate systems, projecting data*.	Ch. 4	
5	20 Sep (M)	**Lab #4: Coordinate Systems.** Map coordinate systems, understanding map distortion, converting coordinate systems when compiling data, understanding transformations, troubleshooting projection problems, creating a custom coordinate system.	Ch. 4	Lab 3 due by 1 PM MT
	22 Sep (W)	**Long-term Project Phase I Presentations**		
6	27 Sep (M)	**Lecture #5: Managing Vector Data.** The vector model, modeling feature behavior with topology, characteristics of GIS data, organizing data files, understanding file locks, finding data for a project, compiling data, modifying and managing data, documenting data; *Discrete data formats, projects and shared data, environmental settings*.	Ch. 5	
	29 Sep (W)	**Lab #5: Managing Vector Data.** Understanding types of GIS data, importing and exporting data, using environment settings, understanding layers, updating metadata, clipping data, exporting from the contents pane, using data from ArcGIS online, getting data from the internet, adding data from tables, appending feature classes.	Ch. 5	Lab 4 due by 1 PM MT

Week	Date	Topic	Reading	Assignment
7	4 Oct (M)	**Lecture #6: Managing Raster Data.** The raster model, raster resolution, storing rasters, raster coordinate systems, 3D Data; *Storing rasters*.	Ch. 6	
	6 Oct (W)	**Lab #6: Managing Raster Data.** Raster format and function, 3D data, image and map services, getting data from the national map, working with elevation data, georeferencing a raster, visualizing space-time data.	Ch. 6	Lab 5 due by 1 PM MT
8	11 Oct (M)	**Lab #6: Editing (Cont.)** **Final Project Work Time**	Ch. 6	
	13 Oct (W)	**Lecture #7: Attribute Data.** Overview of tables, database management systems, joining and relating tables, statistics on tables, field types; *tables in ArcGIS, editing and calculating fields, importing tables*.	Ch. 7	
9	18 Oct (M)	**Lab #7: Attribute Data.** Viewing tables, using queries and statistics on tables, using the fields view, relating tables, editing values in tables, creating domains, calculating fields in tables, exploring data with charts, working with excel data	Ch. 7	Lab 6 due by 1 PM MT
	20 Oct (W)	**Midterm Exam**	Ch 1-7	
10	25 Oct (M)	**Lecture #8: Editing.** Editing and topology; *What can be edited?, editing tools, tools to create and maintain topolog*y, editing annotation.	Ch. 8	
	27 Oct (W)	**Lab #8: Editing.** Creating new feature classes, digitizing points and lines, working with snapping, using the sketch context menus, digitizing polygons, adding buildings, using the attributes pane, creating and editing annotation.	Ch. 8	Lab 7 due by 1 PM MT
12	1 Nov (M)	**Lecture #9: Queries.** What queries do, attribute queries, spatial queries, extraction functions; *Processing layers with selections, interactive selection, making selections, choosing the selection type, managing results from queries.*	Ch. 9	
	3 Nov (W)	**Lab #9: Queries.** Using interactive selection, selecting by attributes, selecting by location, combining queries, definition queries, exporting data, spatial analysis using queries.	Ch. 9	Lab 8 due by 1 PM MT
13	8 Nov (M)	**Lecture #10: Joins and Overlay.** What is a spatial join, spatial join examples, cardinality in spatial joints, classic overlay, data quality factors in spatial analysis; *Setting up a spatial join.*	Ch. 10	
	10 Nov (W)	**Lab #10: Joins and Overlay.** Spatial joins, managing cardinality options, merged point to polygon joins, distance joins, using intersect for habitat analysis, overlay of lines in polygons, combining overlay with buffers, relationships with union, working with slivers and tolerances.	Ch. 10	Lab 9 due by 1 PM MT

Week	Date	Topic	Reading	Assignment
14	15 Nov (M)	**Lecture #11: Raster Analysis.** Raster data, raster analysis; *Using spatial analyst.*	Ch. 11	
	17 Nov (W)	**Lab #11: Raster Analysis.** Performing a boolean overlay, distance functions and buffers, topographic functions, neighborhood functions, converting rasters to features, interpolation and zonal statistics.	Ch. 11	Lab 10 due by 1 PM MT
15	22 Nov (M)	**Term Project Progress and Preparation**		
	24 Nov (W)	**Term Project Progress and Preparation**		Lab 11 due by 1 PM MT
16	29 Nov (M)	**Term Project Progress and Preparation**		
	1 Dec (W)	**Term Project Progress and Preparation**		
17	6 Dec (M)	**Long Term Report Due and Poster Presentation** (1:00 PM – 3:45 PM) https://www.utep.edu/student-affairs/registrar/Scheduling/Final%20Exams%20Schedule/FinalExamScheduleFall2021.pdf		

Course Resources: Where you can go for assistance

UTEP provides a variety of student services and support:
Technology Resources
- Help Desk: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources
- UTEP Library: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources

- Military Student Success Center: Assists personnel in any branch of service to reach their educational goals.
- Counseling and Psychological Services: Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.