BIOL 854: Biological Applications of GIS

2022 SYLLABUS

Instructor: Dustin Ranglack, BHS 343, ranglackdh@unk.edu
Student hours: <mark>XXXX</mark> or by appointment

Learning objectives:
1. Understand the fundamental theory of Geographic Information Science behind Geographic Information Systems (GIS), and in so doing build an awareness of what GIS can and cannot be used for
2. Become proficient in the use of GIS tools to conduct spatial analyses and build maps that are fit-for-purpose and effectively convey the information they are intended to
3. Build confidence in teaching your-self how to undertake new analyses (unfamiliar to you) using GIS, troubleshooting problems in GIS, and seeking help from the GIS community to solve your problems
4. Use GIS analyses to address applied problems and/or research questions
5. Become effective in building maps that can be shared with non-GIS users (e.g. PDF maps and interactive webGIS maps)

Format
The course will be a mix of lecture, discussion, and hands-on labs.

Lecture
The first few weeks of the course will consist of more lecture as we work our way through a lot of foundational material on GIS. Later, we will have some lectures and spend more time discussing scholarly literature and current research and focus more on actually doing GIS.

Lab
"Labs" will typically start with a brief introduction lecture (typically < 15 min) and question and answer session. The bulk of the lab will be spent doing hands on lab assignments and projects using desktop ArcGIS. Everything you need to complete the labs is online in the lab assignment pages, and you submit your assignments via Canvas. You can also get help on labs via the class forum. However, the labs serve the following important functions:

Software
We will use ArcGIS Online. It is your responsibility to ensure that you have a computer that will be able to run the required software. You cannot complete the course without access to this software.

The reason we use ArcGIS is because it is the industry standard and the vast majority of employers, universities and agencies you may end up working for will most likely be using ArcGIS as well. All of the principles and theory we learn in this course, will apply to any GIS software.

Open Source Desktop GIS Alternatives to ArcGIS

- QGIS - Free, open source GIS desktop (runs in Windows, Linux, Mac OS)
- MapWindow GIS – Free, open source GIS desktop application and programming component (only runs in Windows).
- Landserf - Free GIS, that focuses on modeling of land surface (i.e. DEMS). Java based GIS runs in Linux, Mac and Windows
- GRASS GIS – Originally developed by the U.S. Army Corps of Engineers, open source: a complete GIS
- SAGA GIS – System for Automated Geoscientific Analysis- a hybrid GIS software.

Required Text:
Bolstad, P., 2019. GIS Fundamentals: A first text on Geographic Information Systems. 6th Edition. ISBN: 978-1593995522 Available here.

Dr. Bolstad has put a lot of resources associated with this book online for free.

Recommended Text:
You may think this is ridiculous, but much of what you need to know (and students frequently forget) is covered in this Dr. Suess Book! In fact, the **six C's you will be graded on** are based on principles outlined in this book that a 3 year old can understand!

Rabe, T., 2002. There's a Map on my Lap! All About Maps. Random House Books. 48 pp.

Grade Overview
My primary concern is that you engage in achieving the **learning objectives** for this course. Your grade is a secondary concern to me, and if you are effectively learning your grade should be a moot point. However, I recognize how motivated some of you are by grades and have attempted to provide clear guidelines (below) to help manage your expectations about what you need to do to earn the grade you want.

Lab Reports	40%
Quizzes	20%
Project	20%
Exams	20%
TOTAL	**100%**

Grading Specifics:
The grading scale used for this class is as follows:
A (93-100%), A- (90-92.99%), B+ (87-89.99%), B (83-86.99%), B- (80-82.99%), C+ (77-79.99%), C (73-76.99%), C- (70-72.99%), D+ (67-69.99%), D (63-66.99%), D- (60-62.99%), and F (below 60%).

In general, grades for the course will be assigned as:

A – Indicates that the work is markedly superior and is without major problems. It is an honors grade denoting that the goals for the class/assignment have been achieved in exemplary fashion.

B – Indicates that the work has met all of the requirements of the assignment or course at a level that is consistently above average.

C – Indicates satisfactory work that is consistently average and that meets the course goals at a sufficient level to pass.

D – Indicates the minimal achievement in order to earn credit, even though the work is below the standard required for good academic standing.

F – Indicates failure to complete an assignment or course, or work that does not fit into the requirements of the assignment or course.

Late assignments: Without a valid excuse, any assignment not turned in on time is a Late Assignment. Late assignments will be docked 10% of its total possible points per day to a maximum deduction of 50%. All late work is due no later than 2 weeks before graduation day for the semester.

I do not grade on a curve, but in instances where no student in the class has earned the total number of available points, I may opt to adjust the total available points to the maximum that any student has achieved at my own discretion.

Where to Get your Grades
Your provisional grades will be updated in Canvas as grades are completed. Please check your grades regularly and if you find any errors or mistakes, please notify me promptly. Final grades will be submitted at the end of the semester to MyBlue.

Labs
All labs consist of a series of tasks to be completed. See the grading rubric for each lab on Canvas.

Quizzes
The format of these quizzes will vary widely, but most are designed to help you gauge your own knowledge and assess where you are at with respect to the lecture material and readings.

The Six C's Rubric
The six C's rubric is designed to emphasize both the technical and artistic aspects that are essential to making effective maps. It is easy to make maps with GIS, but making good and effective maps (the work cartographers used to do) requires careful thought and skill. Cartography is a skill you can learn and need not become a lost art.

The 6 C's and their definitions are:

1. **Colorful** - (but not cluttered) *An effective use of color to distinguish features and emphasize key aspects of your map.*
2. **Creative** - (but not confusing) *There are lots of creative ways to display your geographic data and analyses*
3. **Correct** - *All analyses, calculations and labels are correct*
4. **Context** - (location, coordinates, projections, scale, orientation, setting) *All maps should have enough context for the user to discern where it is, what it's about and what the scale is within the context that its presented (e.g. stand-alone map vs. within a report).*
5. **Convincing** - (fit for purpose) *All maps have a purpose, and your map should be effective at conveying the message it is intended to.*
6. **Consistent** - *There should be logical, graphical and typographic consistency both within a single map and amongst multiple maps in the same assignment or project.*

For every lab, the 6 C's and other important grading criteria are spelt out for you in a lab-specific rubric on Canvas. If you meet all the basic expectations, this will generally earn you a B. To earn an A, you need to do exceptional work.

Feedback
It is not always feasible to provide detailed written feedback on every lab assignment. For the first few labs, I will try to provide more feedback then normal to help acquaint you with the grading system and expectations. The rubrics are designed to give you an idea (for each map you are required to include in your lab assignments) of where specifically you are doing well, versus where you need to improve. At my discretion, more detailed written feedback may be provided. In general I will provide more detailed feedback when a) you have shown a lot of effort, but did not get it right; b) you have shown responsiveness to previous specific feedback and incorporated this in you new assignments; and/or c) you have demonstrated a genuine interest in learning the material and have sought help, clarifications and/or followed up on previous feedback.

In addition to the basic feedback (6 C's) and the discretionary written feedback on your assignments, I will provide the following:

- To the entire class:
  - Specific feedback and answers to questions posted on the forums
  - General feedback about specific trends and problems encountered across the class for each lab assignment (this will happen at the beginning of labs)
  - I will encourage people to browse each others websites and provide comments on maps, vote in polls on maps, and I will nominate outstanding maps
- To individuals upon request:
  - Verbal feedback elaborating on how their grade was arrived upon and how they can improve in the future
  - Written feedback for a specific map(s) in an assignment if requested

Procedure for Requesting an Explanation & Potential Reconsideration of Grade
I may occasionally get a grade wrong, or make a mistake in grading your work. It is your responsibility to check your grades and read the feedback and make sure I got it right. I am happy to explain how I arrived at a particular part of your grade (not the entire grade for an

assignment as this is clear from the above information). I am also happy to fix your grades if I made a mistake.

The procedure for **requesting an explanation for a specific grade** (e.g. as part of a specific task) is simple. First approach me (in person in lab or during office hours is best, but an email will suffice) and point out what has surprised or confused you about your grade (be specific) and ask for a clarification.

After hearing the explanation, if you wish to **submit a formal request for us to reconsider your grade**, please do so in the form of an email. Please make sure that it is worth requesting a reconsideration of your grade, because I will look at the entire assignment again and it is possible that your reconsidered grade may be lowered.

"Extra credit" work
I may assign extra credit problems for the labs. On occasion I may reward outstanding efforts with some extra credit where appropriate. In addition, extra credit will be awarded for those going above and beyond in helping their peers (includes in-lab evidence, discussion board evidence, etc.). Extra credit will never exceed 10% of the available points for any given assignment.

Email: You must use your UNK email to receive any updates associated with the course. Email is also a quick and convenient way to contact your professors regarding questions associated with the course. However, please be thoughtful when sending emails as emails sent after 3 pm on Fridays will be answered on the following Monday.

Course Policies: Classrooms should be considered sanctuaries for the pursuit of knowledge. Those who enter them should be committed to learning and to respect the ideas and opinions of others. Undesirable behavior in the class will lead to dismissal from the lecture or laboratory session and even expulsion from the course. Undesirable behavior includes (but is not limited to), harassment of any kind, disrupting class when arriving late, and continuously talking at inappropriate times during class sessions.

Academic Integrity and Academic Honesty: This course, like all UNK courses, abides by all University policies as outlined in the UNK Student Handbook, which contains the UNK Student Code of Conduct. More information can be found in the University Undergraduate catalog (https://catalog.unk.edu/undergraduate/).

> **Plagiarism and Cheating:** Anyone found plagiarizing or cheating will receive a 0 for that assignment; subsequent violations will result in referral to the Vice Chancellor for Academic Affairs. Cheating (at any level) is an intolerable behavior that has no place in any scientific, educational, or social activity. Penalties for cheating and plagiarism can be found in the University catalog (http://catalog.unk.edu).

Policy on Withdraw (W) and Incomplete (I) grades: Students may not withdraw past the mid-point of a class unless extenuating circumstances exist, in which case the student may receive a "W". Extenuating circumstances are defined as circumstances that occur AFTER the mid-point

of the course and beyond the control of the student which in the judgment of the Vice Chancellor for Academic Affairs, in consultation with the Exceptional Withdrawal Committee, constitute appropriate cause for withdrawal.

Students will receive a "W" on their transcript (which indicates a withdrawal) for classes dropped on or after the first day of the class. A failing grade of "F" will be recorded on the transcript if a student stops attending class and neither officially withdraws from the course prior to the appropriate deadline nor establishes, prior to the end of the class and to the satisfaction of the instructor, that extenuating circumstances prevented completion of the course.

To be considered for an incomplete, a mark of "I" is reserved for conditions in which a student has been unable, due to circumstances beyond his or her control, to complete the course by the end of the term. Unless an extension of time is granted in writing by the Office of Student Records and Registration, an incomplete must be removed within twelve calendar months. If the course work is not completed during this time, then the "I" will convert to an "F" on the student's transcript and cannot be changed other than by re-registering for the course.

If an extension is desired, the student must initiate a written request for a specific time of extension, must exhibit extenuating circumstances beyond his/her control, and must make the request in advance of the twelve-month expiration. The request must be supported by a written endorsement from the course instructor, or the department chairperson in the absence of the instructor and submitted to the Registrar's Office prior to the expiration of the twelve-month period.

Distribution of course materials: Audio or video recording, digital or otherwise, of lectures, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructors or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s). Any further use or dissemination of this material may be in violation of Federal copyright law and University sanctions including failure in the course.

University Policies Related to COVID-19: The university community is deeply concerned for the well-being of its students, faculty, and staff. Keeping each other as safe as possible will require commitment from each of us; failure to do so will literally place lives in danger. The full policy relating to mitigation of the spread of infectious diseases can be found at https://www.unk.edu/coronavirus/ Policies that apply to all courses (online, remote, blended, or face-to-face) include:

- Students shall monitor their health daily. No student shall attend classes in person while sick. Those who have had contact with positive-tested individuals or show COVID-19 related symptoms must have clearance from the Public Health Center prior to returning to face-to-face classes. There will be no penalties for missing classes for COVID-19 related absences provided the student has documentation from the Public Health Center. Students will still be responsible for course content through alternative attendance or other options arranged with the instructor.

Additional policies specific to face-to-face instruction include the following:

1. During Phases I and II, all students are <u>required</u> to wear masks that cover the nose and mouth at all times during class and at any time, inside or outside, where physical distancing of at least 6' is not possible. Instructors have the authority to direct students who refuse to wear masks to leave the classroom. Students who have medical issues that make masks inadvisable should contact Disability Services for Students at 308.865.8214 to request an exemption.
2. Students shall not arrive for class more than 5 minutes before the scheduled start time for the course. Instructors shall dismiss students promptly at the end time and all shall leave the classroom promptly. Students who have questions should use office hours rather than before/after class times.
3. Instructors and students should clean their desks prior to class. Cleaning materials will be provided.
4. Additional requirements for Phase III, for specialty courses such as labs or performing arts, or for experiential learning are detailed below.
   a. Vaccination is strongly recommended for all students. It has proven to be effective and safe.
   b. When visiting the instructor during office hours, masks are required. If you do not wish to wear a mask, any meetings will take place via Zoom.

Questions regarding COVID-19 should be directed to the Public Health Center unkhealth@unk.edu or 308-865-8254. Questions regarding the COVID-19 academic policy should be directed to Sr. Vice Chancellor Bicak at bicakc@unk.edu. Questions regarding department specific requirements should be directed to Dr. Julie Shaffer at shafferjj@unk.edu.

The above directions must be followed by everyone for the health and safety of our University. Students who do not comply may face disciplinary action from the university. Violations of any University or Campus Policy is a violation of the Student Code of Conduct.

<u>Learning Commons</u>
UNK provides assistance to help you improve your academic performance. The Learning Commons, located on the 2nd floor of the Calvin T. Ryan Library, centralizes several academic services in one convenient place: Language Learning Support, Library Services, Subject Tutoring, Success Coaching, Supplemental Instruction, and the Writing Center are all offered in a casual, collaborative environment. Most services are facilitated by fellow UNK students, which means you will be able to learn and practice more effective study skills, problem-solving techniques, and writing strategies with people who have "been there" and "done that"! Statistics indicate that students who come to the LC regularly are more likely to succeed in their classes--**so come early and come often**. For more information about schedules and services, contact the Learning Commons at 865-8905 or visit them online at www.unk.edu/lc.

Students with Disabilities
It is the policy of the University of Nebraska at Kearney to provide flexible and individualized reasonable accommodation to students with documented disabilities. To receive accommodation services for a disability, students must be registered with the UNK Disabilities Services for Students (DSS) office, 175 Memorial Student Affairs Building, 308-865-8214 or by email unkdso@unk.edu

UNK Statement of Diversity & Inclusion:
UNK stands in solidarity and unity with our students of color, our Latinx and international students, our LGBTQIA+ students and students from other marginalized groups in opposition to racism and prejudice in any form, wherever it may exist. It is the job of institutions of higher education, indeed their duty, to provide a haven for the safe and meaningful exchange of ideas and to support peaceful disagreement and discussion. In our classes, we strive to maintain a positive learning environment based upon open communication and mutual respect. UNK does not discriminate on the basis of race, color, national origin, age, religion, sex, gender, sexual orientation, disability or political affiliation. Respect for the diversity of our backgrounds and varied life experiences is essential to learning from our similarities as well as our differences. The following link provides resources and other information regarding D&I:
https://www.unk.edu/about/equity-access-diversity.php

Students Who are Pregnant
It is the policy of the University of Nebraska at Kearney to provide flexible and individualized reasonable accommodation to students who are pregnant. To receive accommodation services due to pregnancy, students must contact Cindy Ference in Student Health, 308-865-8219. The following link provides information for students and faculty regarding pregnancy rights. http://www.nwlc.org/resource/pregnant-and-parenting-students-rights-faqs-college-and-graduate-students

Reporting Student Sexual Harassment, Sexual Violence or Sexual Assault
Reporting allegations of rape, domestic violence, dating violence, sexual assault, sexual harassment, and stalking enables the University to promptly provide support to the impacted student(s), and to take appropriate action to prevent a recurrence of such sexual misconduct and protect the campus community. Confidentiality will be respected to the greatest degree possible. Any student who believes she or he may be the victim of sexual misconduct is encouraged to report to one or more of the following resources:

Local Domestic Violence, Sexual Assault Advocacy Agency 308-237-2599

Campus Police (or Security) 308-865-8911

Title IX Coordinator 308-865-8655

Retaliation against the student making the report, whether by students or University employees, will not be tolerated.

If you have an accommodation plan please see me as soon as possible, so we can make any arrangements necessary for your learning. No accommodations can be provided until a Reasonable Accommodation Plan is in place. Please remember, plans are not retroactive and cannot be used for assignments prior to the date of my signature.

Veterans Services. UNK works diligently to support UNK's military community by providing military and veteran students and families with resources and services to help them succeed. Veterans Services assists with the GI Bill process and acts as a liaison between the student and

the Veterans Administration. If you need assistance or would like more information, please contact Lori Weed Skarka at 308-865-8520 or unkveterans@unk.edu.

SUBJECT TO CHANGE: *This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements or assignments made while you were absent.*

Tentative Schedule:

Week	Topic
1	1:Introduction
2	2:Data Models
3	3:Geodesy and Map Projections
4	4:Data Entry and Editing
5	5:Global Navigation Satellite Systems
6	6:Aerial and Satellite Images
7	7:Digital Data Sources
8	8:Tables and Relational Databases
9	9:Basic Spatial Analysis
10	10:Topics in Raster Analysis
11	11:Terrain Analysis
12	12:Interpolation and Spatial Estimation
13	13:Spatial Models
14	14:Data Standards and Quality
15	15:Future Trends
16	Finals