Course Name: GISCIENCE II: ANALYSIS & APPLICATIONS
Course Number: GEOG 561
Credits: 4

Instructor name: James Watson
Instructor email: james.watson@oregonstate.edu
Office hours: Thurs 1-2pm online (on the zoom link below)
Instructor's office hours Zoom:
https://oregonstate.zoom.us/j/95973317645?pwd=Tm9ZeklDeHVtKzVxOHdERWZrRHdiUT09
Password: 304681

TA: Ms. Kanchan Ojha, Ph.D student in Environmental Science;
TA email: ojhak@oregonstate.edu
TA's office hours: Fridays 11am-12pm, Strand 348
TA's office hours on Zoom:
https://oregonstate.zoom.us/j/93865462879?pwd=aFhscXhyTFJXR1ZHUFpyL2hnNExEdz09

Course Description

This is an applications-based course. Development and conduct of geospatial analyses using various spatial data structures, techniques and models. Acquire, clean, integrate, manipulate, visualize and analyze geospatial data through laboratory work.

Communication

All course announcements will be posted via Canvas; any scheduling updates and reminders will appear there.

I will use Canvas 'conversations' (inbox button, Canvas main menu on left side) if I need to contact you individually. I ask that you do the same when contacting me directly. I will reply to course-related questions sent via Canvas conversations within 24-48 hours.

Office Hours: by appointment, phone or Zoom.

Time Expectations

This course combines approximately 90 hours of instruction, online activities, and assignments for 4 credits

Technical Assistance

If you experience any errors or problems while in your online course, contact 24-7 Canvas Support through the Help link within Canvas. If you experience computer difficulties, need help downloading a browser or plug-in, or need assistance logging into a course, contact the IS Service Desk for assistance. You can call (541) 737-8787 or visit the IS Service Desk online.

Learning Resources
All learning materials will be posted in Canvas. There is no textbook required for this course.

Measurable Student Learning Outcomes
By the end of the term, students will:

- Be exposed to a wide variety of quantitative methods for studying social-ecological systems
- Practice investigating quantitative problems associated with the study of social-ecological systems, using mathematics, computers and data.
- Develop competence in coding, in particular the R coding language.

Evaluation of Student Performance
There will be NO midterm or final exams. There are a total of 100 points available for this course:

- *Reading* assignments (10% of your grade): 10 points if you submit >50% of your reading assignments. 0 points otherwise.
- *Writing* assignments (10% of your grade): 10 points if you submit >50% of your writing assignments. 0 points otherwise.
- *Coding assignments* (20% of your grade): You will receive 20 points if you submit >50% of coding assignments, and if the code that you submit runs without any errors. 0 points otherwise.
- *Project* (60% of your grade):
    a) Pitch - 10 points
    b) Report - 30 points
    c) Code - 10 points
    d) 5 minute presentation - 10 points
- *Discussion*: +10 extra credit points if you submit a question, or provide a response >3 times during the course.

Letter Grade

Grade	Percent Range
A	94-100
A-	90-93.99
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
F	0-59.99

COURSE STRUCTURE AND POLICIES

Weekly Participation
Students are expected to participate in all graded and non-graded assignments. Assignments are due on Sundays 11:59 PM at the end of the week.

Every week:

1) We will be using canvas (all course material, discussions, assignments...etc.,) and Google Drive/Docs
2) Two lectures every week (~45 mins, with 45 mins QnA):
    a) Chalk and talk by James (Monday)
    b) Watch a recorded presentation by a researcher (Wednesday)
3) All recordings will be made available on Canvas
4) A coding assignment (created by the week's presenting researcher)
5) A writing assignment (two sentence description of the week's presenter's research)
6) A reading assignment (read a paper, write 1 paragraph)
7) Lab: debugging with the TA, go through media
8) An online discussion (e.g. Stack Overflow solutions)

Research Project
The main outcome of the course is your individual research project, where:

- You will have identified your research question
- You will have synthesized the necessary data to answer your research question
- You chose and implemented the analytical technique to use

It is the largest part of your grade, and includes: a) a written report, b) your code and c) a 5 minute presentation. The report is structured as follows:

- Project Title, author list.
- <1 page introduction
- <1 page methods
- Results: however many pages you need
- <1 page discussion

Working in groups is fine! If you do work in a group, submitting the same code and presentation is fine, but make sure your report is unique.

Coding Assignments

All coding assignments will be in R. To use R, you can either download and use Rstudio, or you can access the cosine server at Oregon State University::

https://rstudio.cosine.oregonstate.edu/auth-sign-in

Login using your ONID details. This will give you an online workspace, and an instance of R studio.

When submitting an assignment, you will zip up a folder containing your code, data and figures that you have created, and upload that to Canvas.

Expectations for Student Conduct
Student conduct is governed by the university's policies, as explained in the Student Conduct Code (https://beav.es/codeofconduct). Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

Academic Integrity
Integrity is a character-driven commitment to honesty, doing what is right, and guiding others to do what is right. Oregon State University Ecampus students and faculty have a responsibility to act with integrity in all of our educational work, and that integrity enables this community of learners to interact in the spirit of trust, honesty, and fairness across the globe.

Academic misconduct, or violations of academic integrity, can fall into seven broad areas, including but not limited to: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use.

It is important that you understand what student actions are defined as academic misconduct at Oregon State University. The OSU Libraries offer a tutorial on academic misconduct, and you can also refer to the OSU Student Code of Conduct and the Office of Student Conduct and Community Standard's website for more information. More importantly, if you are unsure if something will violate our academic integrity policy, ask your professors, GTAs, academic advisors, or academic integrity officers.

Statement Regarding Students with Disabilities
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval, please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Statement Regarding Religious Accommodation

Oregon State University is required to provide reasonable accommodations for employee and student sincerely held religious beliefs. It is incumbent on the student making the request to make the faculty member aware of the request as soon as possible prior to the need for the accommodation. See the Religious Accommodation Process for Students.

Guidelines for a Productive and Effective Online Classroom
(Adapted from Dr. Susan Shaw, Oregon State University)
Students are expected to conduct themselves in the course (e.g., on discussion boards, email) in compliance with the university's regulations regarding civility. Civility is an essential ingredient for academic discourse. All communications for this course should be conducted constructively, civilly, and respectfully. Differences in beliefs, opinions, and approaches are to be expected. In all you say and do for this course, be professional. Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Active interaction with peers and your instructor is essential to success in this online course, paying particular attention to the following:

- Unless indicated otherwise, please complete the readings and view other instructional materials for each week before participating in the discussion board.
- Read your posts carefully before submitting them.
- Be respectful of others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
- Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully, and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.

Student Evaluation of Courses
During Fall, Winter, and Spring term, the online Student Evaluation of Teaching system opens to students the Wednesday of week 8 and closes the Sunday before Finals Week.
Students will receive notification, instructions and the link through their ONID email. They may also log into the system via Online Services. Course evaluation results are extremely important and used to help improve courses and the learning experience of future students. Responses are anonymous (unless a student chooses to "sign" their comments, agreeing to relinquish anonymity) and unavailable to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.

COURSE CONTENT

Week	Topic	Learning Materials	Learning Activities
1	Introduction to the Course	Reading: Navigating the chaos of an unfolding global cycle; Lecture 1: Introduction to course, motivation, syllabus review, mind-map of the course, introduction to the cutting edge of geospatial analysis and applications and communication Video lecture: from Dr. Watson on the Anthropocene Other readings and videos and podcasts as listed in Canvas.	Online discussion Week 1 coding assignment; Week 1 Reading Assignment; Week 1 Writing Assignment;
2	Socio-Environmental Systems: Space, Time and Relationships	Reading: Ecosystems and the biosphere as complex adaptive systems. Lecture 1: Spatial data types (raster, vector), matrices, arrays, exploratory data analysis (distributions, outliers) Project work: start developing ideas for project: identify system, question; identify project themes and split up into groups. Iterate on question, mine literature for state of the art, identify data sources. Message box pitch! Video lecture: Dr. Theresa Nogiere about landscape ecology and connectivity. Other readings and videos and podcasts as listed in Canvas.	Week 2 Discussion Week 2 coding assignment; Week 2 Reading Assignment; Week 2 Writing Assignment; Week 2 Project Assignment -Pitch;
3	Distance, Scale and Networks	Reading: Future of the Human Climate Niche. Lecture 1: Calculating distance (in n-dimensions), scale, coarse-graining, grid scale. Introduction to networks, least-cost paths, network distance. Project work: iterate of research questions and data availability.	Week 3 Discussion Week 3 coding assignment; Week 3 Reading Assignment; Week 3 Writing Assignment; Week 3 Project Assignment Research Interest;

		Video lecture: Guest lecture from Dr. Ernesto Villarino's talk about distance in the oceans. Other readings and videos and podcasts as listed in Canvas.	
4	Spatial Pattern Analysis and Point-Pattern Analysis	Reading: Resilience: The emergence of a perspective for social–ecological systems analyses Lecture 1: Autocorrelation, interpolation, point pattern analysis.. Project work: obtain data, perform exploratory data analysis, figure storyboard, sketch out methods Video lecture: Anne Devan-Song about ecological spatial analysis Other readings and videos and podcasts as listed in Canvas.	Week 4 Discussion Week 4 coding assignment; Week 4 Reading Assignment; Week 4 Writing Assignment; Week 4 Project Assignment Research Question or Hypothesis
5	Clustering and Network Analysis	Reading: Social networks in natural resource management: what is there to learn from a structural perspective? Lecture 1: networks construction, similarity matrices, distances again, community detection, clustering algorithms (k-means) Video lecture: Keiko Normura's talk about socio-environmental networks in marine systems Other readings and videos and podcasts as listed in Canvas.	Week 5 Discussion Week 5 coding assignment; Week 5 Reading Assignment; Week 5 Writing Assignment; Week 5 Project Assignment Research Materials and Methods
6	Introduction to Time Series	Reading: Catastrophic regime shifts in ecosystems: linking theory to observation. Lecture on basic time-series analysis. Video lecture: Steven Johnson's talk about climate change and the emergence of novel ecosystems;	Week 6 Discussion Week 6 coding assignment; Week 6 Reading Assignment; Week 6 Writing Assignment; Week 6 Project Assignment

		Other readings and videos and podcasts as listed in Canvas.	Research Data Analysis
7	Introduction to Time Series II	Reading: Dealing with femtorisks in international relations. Lecture 1: advanced time-series analysis, finding the signal in the noise, dimensional reduction, fourier decomposition and wavelet analysis, Principal Components Analysis (Empirical Orthogonal Analysis) Video lecture: None this week Other readings and videos and podcasts as listed in Canvas.	Week 7 Discussion Week 7 coding assignment; Week 7 Reading Assignment; Week 7 Writing Assignment; Week 7 Project Assignment Research Data Analysis Continued
8	From Regression to Machine Learning Part I	Reading: Species distribution models: ecological explanation and prediction across space and time Lecture 1: Project work! Writing Video lecture on Linear Regression and local regression from Steven Johnson; Other readings and videos and podcasts as listed in Canvas.	Week 8 Discussion Week 8 coding assignment; Week 8 Reading Assignment; Week 8 Writing Assignment; Week 8 Project Assignment Research Project Narrative
9	From Regression to Machine Learning Part II	Reading: Existential Risks; Lecture 1: Overview lecture covering the main learning outcomes of the course Video lecture: machine learning and species distribution modeling from Dr. John Woodill. Other readings and videos and podcasts as listed in Canvas.	Week 9 Discussion Week 9 coding assignment; Week 9 Reading Assignment; Week 9 Writing Assignment; Week 9 Project Assignment Presentation Week 9 Project Report

10	Presenting Research Projects	No new readings; No lectures; Project Presentations and Peer Review. Final Project Code Assignment	Week 10 Discussion Week 10 Project Code Week 10 Project Peer Review
11 (finals)	Complete all remaining assignments	No finals! Submit all project material	Good luck in the future