Course Number	ARC6912 – Section -SDAI(24259)
Course Title	**Sustainable Design Problem Solving through Data-Driven Research (Intro) and AI Application (Data-Driven Research, GIS & AI Application) – 2**
Term	Spring 2026
Instructor	Djundi Tjindra-Chen, Ph.D., MSAS, Dipl.-Ing. eMail: djundi@ufl.edu Office Hours: by appointment
Credits	3 per semester (2 semesters, total: 6 credit hours)
Class Time	Friday, 6:00pm to 8:00pm EST/EDT
Room Number	online (Zoom links; refer to Canvas).

PREREQUISITES

ARC6912 Sustainable Design Problem Solving through Data-Driven Research and AI Application – 1

COURSE DESCRIPTION

This two-semester graduate course serves as a foundational step into an exciting approach to design thinking, blending technology with sustainable architectural practices. It equips students with essential skills in data-informed design thinking, research methodology, spatial analysis, and the use of artificial intelligence (AI) as a tool for sustainability. The course emphasizes not only the practical application of AI but also its responsible and ethical use in addressing sustainability challenges. Accessible to students from diverse academic backgrounds, it fosters critical thinking and enables further exploration of advanced applications in sustainable design, all without requiring prior coding experience.

In Semester 1, students explore data-informed sustainability, fundamental statistical concepts, and introductory Geographic Information Systems (GIS). Through hands-on labs and real-world examples, students learn to collect, analyze, and interpret data to identify environmental challenges and support sustainable design strategies.

In Semester 2, students expand their GIS proficiency and explore spatial analysis, data integration, and visualization techniques. They are also introduced to no-code AI tools for pattern recognition and forecasting in environmental applications. The semester culminates in a capstone project that integrates survey data, statistical and spatial analysis, AI tools, and visual storytelling to address a sustainability problem.

Throughout both semesters, students are encouraged to think critically about the ethical implications of data and technology in sustainable design. The course fosters a multidisciplinary skillset, preparing students to make evidence-based, human-centered design decisions in increasingly data-rich environments.

COURSE & LEARNING OBJECTIVES

By the end of this course, students will be able to design and conduct data-informed investigations into sustainability challenges, applying foundational skills in research methods, statistics, GIS, and no-code AI. They will be equipped to collect and analyze spatial and non-spatial data, create effective visualizations, and critically evaluate the ethical use of technology. Through an integrative capstone project, students will demonstrate the ability to synthesize insights into actionable, evidence-based design or planning proposals:

Semester 1 – Foundations of Data-Driven Research (3 Credits)
By the end of Semester 1, students will be able to:

1. Frame researchable questions related to sustainability and the built environment: Use scientific thinking and design inquiry to explore environmental and societal challenges.

2. Design and implement basic data collection methods, with attention to ethics and data integrity.
3. Apply descriptive and inferential statistics to environmental and spatial data: Understand distributions, variability, significance, and correlation to interpret data meaningfully.
4. Use GIS to visualize and explore spatial patterns: Understand spatial data types and coordinate systems; build and interpret basic maps.
5. Critically evaluate data quality, sampling, and statistical results: Recognize fallacies and misuse of data, such as p-hacking or misinterpreted trends.

Semester 2 – Spatial Analysis, Data Integration, Visualization and AI Applications (3 Credits)
By the end of Semester 2, students will be able to:

1. Conduct spatial analysis for sustainability challenges using GIS tools: Perform thematic mapping, spatial statistics, and spatial interpolation to inform environmental decision-making.
2. Integrate and visualize diverse datasets: Combine spatial and non-spatial data into dashboards, story maps, and interactive visualizations.
3. Apply no-code AI and machine learning tools to environmental datasets: Use AI for pattern recognition, classification, forecasting, and spatial feature extraction.
4. Evaluate ethical implications and limitations of AI and data in design contexts: Analyze issues of bias, transparency, and responsible technology use.
5. Synthesize multi-source data into a compelling design proposal: Develop and present a capstone project that integrates data collection, statistics, spatial analysis, AI, and visual storytelling in response to a sustainability issue.

COURSE STRUCTURE

- 1-hour lecture (live online and/or pre-recorded), and
- 2-hour interactive session (lecture, hands-on lab, or workshop). On-demand support: Optional tutoring sessions for additional guidance.

RECOMMENDED TEXTBOOKS

- Madsen, Birger. *Statistics for Non-Statisticians*. 1st ed. 2011. Berlin, Heidelberg: Springer Berlin Heidelberg, 2011.
- McHaffie, Patrick, Sungsoon Hwang, and Cassie Follett. *GIS: An Introduction to Mapping Technologies*. 2nd ed. Boca Raton, FL: CRC Press, Taylor & Francis Group, 2023.
- De Smith, M. J., Goodchild, M. F., & Longley, P. (2018). Geospatial analysis: a comprehensive guide to principles, techniques and software tools (6th edition).
- Joshi, P. M., & Mahalle, P. N. (2022). *Data storytelling and visualization with tableau: a hands-on approach.* CRC Press.
- Dougherty, J., Ilyankou, I., & Safari, an O'Reilly Media Company. (2021). *Hands-on data visualization: interactive storytelling from spreadsheets to code* (1st edition). O'Reilly Media, Inc.
- Theobald, O. (2017). Machine learning for absolute beginners: a plain English introduction.
- Weng, Q. (Ed.). (2024). *Handbook of Geospatial Approaches to Sustainable Cities*. CRC Press.
- Gao, S., Hu, Y., & Li, W. (Eds.). (2023). Handbook of Geospatial Artificial Intelligence (1st ed.). CRC Press.
- Kumar, Ranjit. *Research Methodology: A Step-by-Step Guide for Beginners*. Fourth edition. Los Angeles: SAGE, 2014.

In addition to the required textbook and recommended readings, other materials—including book chapters, reports, and articles from academic journals and industry magazines—will be assigned throughout the

semester. Additional recommended books will be introduced throughout the course. Students are expected to complete readings in advance to support class discussions and project objectives.

COURSE CONTENT*

Semester 2 – Spatial Analysis, Data Integration, Visualization and AI Applications (3 Credits)
Focus: Spatial Analysis, AI applications, and integrated sustainability design, visualization, capstone.
Each module includes one or more assignments; please refer to Canvas Assignments for details.

Module 5: Applied GIS for Sustainability (3-4 weeks: 01/16-02/06)

- Thematic mapping: land use, urban heat islands, flood risk, green space
- Intro to spatial statistics (mean center, SDE, spatial joins, buffers)
- Understanding and measuring spatial autocorrelation
- Understanding spatial interpolation

Module 6: Data Integration & Visualization (2-3 weeks: 02/13-02/27)

- Data handling/processing
- Data integration and bringing together spatial and non-spatial data
- Data management
- Intro to data visualization
- Dashboards using Tableau
- Story maps and narrative design
- Practice: Build a multi-layer interactive map

Spring break: 02/20, 2026

Module 7: AI Tools for Pattern Recognition (3-4 weeks: 03/06-04/03)

- Intro to no-code AI/ML platforms
- Pattern recognition, clustering, classification
- AI-assisted environmental forecasting
- Hands-on: AI applied to sustainability data
- Application of deep learning in the identification of spatial patterns and shapes

Module 8: Critical AI & Ethics (1 week: 04/10)

- Bias, transparency, explainability
- Responsible AI use in design
- Reflection: When not to use AI
- Group discussion: AI & sustainability case studies

Module 9: Capstone Project ** (3-4 weeks: 04/03-04/29)

- Students develop and present a project that addresses a sustainability issue. This project should integrate the following methods: survey, statistical analysis, and spatial analysis using GIS, an AI tool/modeling, various visualization tools and storytelling.
- Peer review and reflection

*) Subject to adjustment to adapt to needs.
**) The Capstone project provides students with the opportunity to engage in a hypothetical or real-world case study. This project can serve as a foundation for further exploration, potentially evolving into their Major Research Project (MRP) or thesis, allowing for deeper investigation into sustainable design challenges.

COURSE ADMINISTRATION

This course will be conducted online, following the UF School of Architecture Studio System, utilizing the platforms listed below, among others:

- CANVAS: Primary portal for course materials and communication.
- ZOOM (https://zoom.us/privacy; https://zoom.us/accessibility): Used for live sessions; links will be available on Canvas.
- ONE-DRIVE: Repository for shared files and collaborative work.
- UF Apps: Provides access to required applications without local installation.

The UF Canvas e-learning portal will serve as the primary platform for sharing electronic course materials and common references. It is accessible at http://elearning.ufl.edu. If you experience access issues, notify your faculty immediately. Zoom will be used for live online sessions. Zoom will be used for live online sessions, and links to Zoom meetings, along with other course platform access, will be available on Canvas.

Online Communication & Netiquette[1]

Although this course is conducted online, it remains a formal learning environment, and appropriate behavior is expected when interacting with peers and instructors. Follow established netiquette guidelines to ensure respectful and professional communication.

Security

Remember that your password is the only thing protecting you from pranks or more serious harm.

- Don't share your password with anyone.
- Change your password if you think someone else might know it.
- Always logout when you are finished using the system.

CLASS PREPARATION

This is a demanding and analytical course, and your preparation should reflect that. For interactive classes, it is strongly recommended to review the assigned readings and pre-recorded lectures in advance. Many students find group discussions beneficial for reinforcing key concepts, though this is optional. However, a significant part of the learning experience in this course comes from active participation in group discussions.

ATTENDANCE POLICY

Our attendance policy is strict: All students are expected to attend every scheduled class. Any absence must be explained via email to the professor.

- Three unexcused absences will result in a full letter grade deduction.
- Four or more unexcused absences will result in a failing grade and/or an automatic drop from the course.
- Late arrivals (within 30 minutes of class start) will count as half an absence. Arriving more than 30 minutes late will be counted as a full absence.

If you are facing serious circumstances that may affect your attendance, please reach out. Accommodations may be made for severe illness, family emergencies, or personal crises.
For more details on UF's absence policy, visit: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies

[1] Adapted from information provided by the UF Center for Teaching Excellence Quality Assurance Committee: Netiquette Guide for Online Courses: https://teach.ufl.edu/wp-content/uploads/2020/04/NetiquetteGuideforOnlineCourses.docx

MAKE-UP POLICY

All seminar sessions are recorded for review; however, recordings cannot fully replicate the interactive learning experience of live group discussions. While discussing the material with a fellow student or arranging a one-on-one session with the professor may provide some guidance, neither can substitute for the collective engagement that takes place during class. In accordance with UF Attendance Policies, students with UF-approved excused absences will be provided reasonable opportunities to make up missed work, assessments, and participation. Please notify the instructor as soon as possible to arrange accommodations consistent with UF policy.

USE of AI POLICY

This course prioritizes your development as an independent writer, thinker, and problem solver. Limited, transparent use of AI tools is allowed for early-stage idea support and language-level proofreading, but not for content generation, substantive revision, translating assignments merely to obtain results instead of learning the material, or otherwise circumventing the assignment's learning goals.
Since the course includes explicit instruction on AI, assignments within the relevant modules may permit the use of specific AI/ML tools; the instructor will specify which tools, uses, and documentation (for example, raw outputs, notebooks, or an AI use statement) are required.
You are responsible for the originality and accuracy of all submitted work, the integrity of your sources, and compliance with assignment requirements. If asked, you may be required to share process artifacts (e.g., notes, outlines, drafts) or to discuss your drafting or work process. Undisclosed or prohibited AI use may result in a failing grade on the assignment or in the course and will be referred to the Dean of Students Office.

If you are unsure whether a use is permitted, ask the instructor before submitting.

General UF AI policies and UF Policy on Student Conduct Violation can be found here → see footnote[2].

ASSIGNMENT SUBMISSION

Unless otherwise specified, assignments must be submitted through the course Canvas website by the designated due date and time. To avoid potential technical issues, students are advised not to wait until the last minute to submit their work. Assignments should not be submitted via email to the instructor.

GRADING

Grading will be structured as follows:

1. 20% – In-class participation and engagement: This includes attendance, effort, progress, and overall attitude. Active participation in class discussions and presentations will significantly impact the final grade.
2. 80% – Assignments:
    - Assignment grades will be based on timely submission and adherence to outlined criteria.
    - Late submissions will incur point deductions as specified in the assignment details.
    - Make-up assignments for extra credit are at the instructor's discretion and are optional. Grading criteria for any make-up assignments will be provided within the assignment itself.

[2] AI Governance: https://privacy.ufl.edu/laws-and-regulations/ai-governance | UF Policy: Student Conduct Violation: https://flexible.dce.ufl.edu/media/flexibledceufledu/documents/uf_policy_student_conduct.pdf | Academic Integrity in the Age of AI: https://teach.ufl.edu/resource-libraryold/academic-integrity-in-the-age-of-ai

- Unless otherwise instructed, all assignments must be completed individually. Students must be mindful of plagiarism and ensure their work is original. Submitting another student's work, copying from external sources without proper citation, or any form of academic dishonesty will be subject to academic integrity policies and may result in penalties.
- The Capstone Project at the end of the semester will carry a greater weight within the assignment grade. However, the specific weight will be determined at the instructor's discretion and announced later in the course.

The following listing of project grades should help to understand their breakdown and grading criteria.

Graduate School Grading Scale + Qualitative Descriptions

	Letter Grade	Numeric Grade	Quality Points	Qualitative Description
PASSING GRADES	A	100-93	4.0	Outstanding work only
	A-	92-90	3.67	Close to outstanding
	B+	89-87	3.33	Very good work
	B	86-83	3.0	Good work
	B-	82-80	2.67	Good work with some problems
	C+	79-77	2.33	Slightly above average work
	C	76-73	2.0	Average work
FAILING GRADES	C-	72-70	1.67	Average work with some problems
	D+	69-67	1.33	Poor work with some effort
	D	66-63	1.0	Poor work
	D-	62-60	0.67	Poor work with some problems
	E	59-0	0.0	Inadequate work

Minimum Cumulative GPA = 3.0

The current UF grading policies can be found at: https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies

Please note that the University of Florida Graduate School requires that a graduate student maintain a 3.0 (B) average to remain in good academic standing. Every possible effort is made to counsel students in academic difficulty to determine the cause and possible solution so that the student can continue and complete their studies in the University. The Graduate School considers grades of C-minus or lower to be failing grades. Note that you cannot graduate with any failing grades (C-minus or lower) or incomplete ("I") grades on your transcript.

An incomplete grade may be assigned at the instructor's discretion as an interim grade only in cases of extreme extenuating circumstances. Incomplete grades must be resolved before starting the final MRP (Master's Research Project) or thesis, as unresolved incompletes will prevent graduation. Failure to complete the requirements before the start of the next semester will result in at least a one-semester delay in program progress.

GENERAL GUIDELINES

When communicating online, you should always:

- Treat instructor and classmates with respect, even in email or in any other online communication.
- Use clear and concise language.
- All college level communication should have correct spelling and grammar.
- Use standard fonts such as Arial, Calibri, Helvetica, or Times New Roman.
- Avoid using all lower cases (as it can be interpreted as lazy) and all upper cases or caps lock feature (AS IT CAN BE INTERPRETTED AS YELLING). We are here try to make you "professional" in all aspects, including preparing documents and communicating.
- Limit and possibly avoid the use of emoticons like :) or 🙂.
- Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post and your message might be taken seriously or offensive.
- Be careful with personal information (both yours and other's).
- Do not send confidential medical or patient information via e-mail.

Email Communications

When you send an email to your instructor, teaching assistant, or classmates, you should:

- Use a descriptive subject line.
- Be concise and clear.
- Use standard file formats for attachments (e.g. PDF, DOCX, XLSX), or confirm that the recipient can open the format you intend to send.
- Sign your message with your name and return e-mail address.
- Think before you send the e-mail to more than one person. Does everyone really need to see your message?
- Be sure you REALLY want everyone to receive your response when you click, "Reply All."
- Be sure that the message author intended for the information to be passed along before you click the "forward" button.

Discussion Board Guidelines

When posting on the Discussion Board, you should:

- Pay attention to manner.
- Be open-minded.
- If you ask a question and many people respond summarize all posts for the benefit of the class.
- When engaged in class discussion:
  - Make discussion that are on topic and within the scope of the course material.
  - Don't repeat someone else's comment without adding something of your own to it.
  - Take your comments seriously.
  - Avoid short, generic replies such as, "I agree." You should include why you agree or add to the previous point.
  - If you refer to something that was said in an earlier post, quote a few key lines so reader do not have go back and figure out which post you are referring to.
  - Avoid plagiarism. Use your own words to analyze and synthesize ideas. Always give proper credit when referencing or quoting sources.
  - If you reply to a classmate's question, make sure your answer is correct, don't guess.
- Always be respectful of others' opinions even when they differ from your own.
  - When you disagree with someone, you should express your differing opinions in a respectful, non-critical way.
  - Do not make personal or insulting remarks.
  - Do not write anything sarcastic or angry; it often backfires.
  - Do not type in ALL CAPS, if you do IT WILL LOOK LIKE YOU ARE YELLING.

Zoom Online Meetings

When attending a Zoom class or meeting, you should:

- Do not share your Zoom classroom link or password with others.
- Enter the room a little early to have time to set up your audio and/or video.
- Even though you may be alone at home your professor and classmates can see you! While attending class in your pajamas is tempting, remember that wearing clothing is not optional. Dress appropriately.
- Mute your microphone when not in use, especially if you are in a location that can be noisy. Don't leave your microphone open if you don't have to.
- Your professor and classmates can also see what is behind you, so be aware of your surroundings. Make sure the background is not distracting or something you would not want your classmates to see.
- When in doubt use a virtual background.
  - If you choose to use one, you should test the background out first to make sure your device can support it.
  - Your background can express your personality but be sure to avoid using backgrounds that may contain offensive images, inappropriate language, nudity, and/or overt political messaging.

Privacy

Remember to safeguard private or sensitive information.

- Be careful with personal information (both yours and other people's).
- Our class sessions may be audio-visually recorded for enrolled students to refer back to and for those unable to attend live. Students who participate with their camera engaged or utilize a profile image agree to have their video or image recorded for purposes of this class only. Students who are un-muted and participate orally agree to have their voices recorded.
- Recording for purposes other than those permitted by UF policy above is prohibited. Unauthorized publication of recorded materials is prohibited.

Use of Reference Material

All references should follow the format used by the American Psychological Association (APA). Citations should appear in the text as follows: (Meyer & Miller, 2014) when using an idea from the text; or (Meyer and Miller, 2014, p. 2-33) when using a specific quote on the indicated page (in this case, page 2-33). A good source of information on the APA format can be found from the Purdue Online Writing Lab: https://owl.english.purdue.edu/owl/resource/560/01/. Students from other departments may use a commonly accepted format for citations from their own field; please discuss this option with the instructor before you complete the outline of the paper.

Assistance for Writing Papers

The online resources to assist you in writing are extensive. The Dial Center for Written and Oral Communication (http://cwoc.ufl.edu/) and the Writing Program (http://writing.ufl.edu) at the University of Florida can assist you in several different aspects of writing. You can use the writing lab to get one-on-one help on every area of composition from basic grammar and mechanics to topics like essay organization, style, and argument.

Many other universities offer online handbooks on writing. I have found the following three particularly useful: the University of North Carolina at Chapel Hill (http://writingcenter.unc.edu/handouts/), the University of Wisconsin (http://writing.wisc.edu/Handbook/), and Purdue University (http://owl.english.purdue.edu/).

I found the following handouts particularly helpful while editing papers:
http://writing.wisc.edu/Handbook/CommonErrors.html and
http://www.wisc.edu/writing/Handbook/ClearConciseSentences.html.

The online handbooks described above discuss many aspects of writing papers. Students at the graduate level should be prepared to write a critical argument rather than simply describe relationships. If you have any questions about what is expected at the graduate level, please see the instructor.

UF POLICIES[3]

University Policy on Academic Misconduct

Academic honesty and integrity are fundamental values of the University community. UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: 'On my honor, I have neither given nor received unauthorized aid in doing this assignment.'" The Student Honor Code and Student Conduct Code (https://policy.ufl.edu/regulation/4-040) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to your faculty instructors.

Plagiarism includes the direct copying of text/images from other sources as well as minor alterations of work created by others (mirroring, application of visual effects/filters/distortions, etc.). Plagiarism is a serious offense and can lead to failure of the course and/or premature dismissal from the Graduate School. We expect that the work you prepare is wholly your own, created this semester for this course. You are expected to provide appropriate citations and/or credit for images, text references, and design influences, where appropriate. If you have any questions or concerns, please consult your instructors.

POLICY on RETAINING WORK

Please note that the University of Florida, College of Design, Construction, and Planning policy states that student's work may be retained indefinitely for academic purposes. You should be prepared for the instructor to ask that it be exhibited or photographed during or after the term. Having your work retained for photography or exhibition is evidence of its quality and value to the School. Not to worry, you will be able either to retrieve your original work or retrieve it temporarily to make copies or photograph it for your own personal purposes.

ACADEMIC POLICIES and CAMPUS RESOURCES

For more information on academic policies and campus resources, visit:
https://go.ufl.edu/syllabuspolicies

CHANGES AND REVISIONS TO SYLLABUS

This syllabus is subject to adjustment. Any changes will be communicated during regular class meetings.

[3] more on the UF Academic policies and resources: https://go.ufl.edu/syllabuspolicies