Fundamentals of Coding and Computation - Introduction to Computer Programming for Architects
ARC 5XXX:
Class Periods: TBD
Location: TBD
Academic Term: Spring 2025

Instructor:
Karla Saldana Ochoa
ksaldanaochoa@ufl.edu
+1 352 294 1453
Office Hours: TBD

Course Description
- Architecture students will **learn** the fundamentals of coding and computation. During the course, students will **understand** concepts such as variables, conditions, loops, algorithms, and libraries. The students will then **implement** these concepts in design exercises to **create** hands-on projects using coding to solve design problems. This course will fulfill university requirements to be categorized as **" Use & Apply AI".**

Course Pre-Requisites / Co-Requisites
Applicants must have obtained a bachelor's degree or better and a minimum upper-division GPA of 3.0 from a regionally accredited institution.

Course Objectives

1. Applying:
   - Implement coding techniques to create solutions for design exercises.
   - Utilize coding languages and tools to develop hands-on projects addressing various design problems.
   - Apply coding skills to translate design concepts into executable programs.
2. Analyzing:
   - Evaluate the effectiveness of different coding strategies in solving design challenges.
   - Analyze coding solutions to identify strengths and weaknesses in addressing specific design problems.
   - Compare and contrast various coding approaches and their applications in design contexts.
3. Evaluating:
   - Assess the appropriateness of coding solutions in addressing design requirements.
   - Judge the effectiveness of coding techniques in achieving desired design outcomes.
4. Creating:
   - Generate innovative coding solutions to design problems.
   - Design and develop original projects integrating coding and design principles.
   - Synthesize coding skills with design concepts to create novel solutions that push the boundaries of traditional architectural practices.

Materials and Supply Fees
None

Required Textbooks and Software

- Rhino
- Grasshopper

- Daniel, Kahneman. "Thinking, fast and slow." (2017).
- Russell, Stuart. Human compatible: Artificial intelligence and the problem of control. Penguin, 2019.
- Hole, Kjell Jørgen, and Subutai Ahmad. "A thousand brains: toward biologically constrained ai." SN Applied Sciences 3.8 (2021): 1-14.
- Hovestadt, Ludger. On Digital Architecture in Ten Books: A Tractatus. Vol. 1, Books 1-3. Applied Virutality Book Series. Boston: De Gryuter, 2022.
- Hovestadt, Ludger.. On Digital Architecture in Ten Books: A Tractatus. Vol. 2, Books 4-6. 1st ed. Boston: De Gryuter, 2022.
- Saldana Ochoa K (2021). Event Protocols: Enhancing Disaster Response with Architectonics Capabilities by leveraging human and Artificial Intelligence Interplay. Doctoral Thesis. ETH Zurich.
- Bühlmann et al. Ethics of Coding: A Report on the Algorithmic Condition, 2017.

Course Schedule

MODULES 1 BASICS OF CODING

Week 1 - What is coding? Intro to Basic Functions in Python

Week 2 - Variables, Functions, and Libraries describe what variables are and how to compute them.

Week 3 - Conditionals. If-Else Statements: The If-Else and If-Elif-Else structures.

Week 4 - Loops. For-loops enable repeatedly executing the code within an established function.

MODULE 2 DATA AND COMPUTATION

Week 5 - Data Structures. Low-Level Data Structuring: this level of data often involves numerical representations, tensor matrices, or even binary data.

Week 6 - Data Structures. High-Level Data Structuring: this level of data structuring often includes preprocessing and feature engineering.

Week 7 - Algorithms. Execute Python operations for dictionaries, mapping numerical data and pixel-wise maps to represent images.

MODULE 3 DESIGN APPLICATION

Week 8 - Application-oriented libraries. Get comfortable with established libraries and datasets used in architecture applications.

Week 9 - Guest Lecture

Week 10 - Spring Break NO CLASSES

Week 11 - GHPython and Grasshopper link, RhinoCommon API. Version differences.

Week 12 - Working with geometry: Examples and case studies.

Week 13 - Read/Write data, GH components in Python, Treehelpers

Week 14 – 15 – Final Project Preparation

Week 16 - Final Project Presentation.

Attendance Policy, Class Expectations, and Make-Up Policy
State whether attendance is required and if so, how will it be monitored?   What are the penalties for absence, tardiness, cell phone policy, laptop policy, etc.   What are the arrangements for missed homework, missed quizzes, and missed exams? This statement is required: Excused absences must be consistent with university policies in the Graduate Catalog (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance) and require appropriate documentation. Additional information can be found here: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (10)	100 each	15%
Quizzes (4)	100 each	15%
Midterm Exam	100	30%
Final Exam	100	30%
Review Paper	100	10%
		100%

UF Coronavirus Policies and Campus Operations
Visit https://coronavirus.ufl.edu/health-guidance/ to stay up to date on UF's COVID related Policies

Attendance Policy, Class Expectations, and Make-Up Policy
Attendance is mandatory. Three or more unexcused absences may result in an administrative drop from the course. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies.

Grading Policy

	Letter Grade	Numeric Grade	Quality Points	Qualitative Description
	A	93 - 100	4.0	Outstanding work only
PASSING GRADES	A-	90 – 92.9	3.67	Close to outstanding
	B+	87 - 89.9	3.33	Very good work
	B	84 – 86.9	3.0	Good work

	B-	80 – 83.9	2.67	Good work with some problems
	C+	77 - 79.9	2.33	Slightly above average work
	C	74 – 76.9	2.0	Average work
FAILING GRADES	C-	70 - 73.9	1.67	Average work with some problems
	D+	67 - 69.9	1.33	Poor work with some effort
	D	64 - 66.9	1.0	Poor work
	D-	61 - 63.9	0.67	Poor work with some problems
	E	0. - 60.9	0.0	Inadequate work

More information on UF grading policy may be found at:
UF Graduate Catalog
Grades and Grading Policies

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Click here for guidance on how to give feedback in a professional and respectful manner. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students here.

Distance Learning Privacy Policy
Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use,

(2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, and exams), field trips, and private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

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 Honor Code 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 appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Students in the School of Architecture are expected to adhere to all University of Florida academic honesty policies. Failure to do so will result in lowered grades and/or referral to the University Honor Court. Since the University's policies are necessarily generalized, the School of Architecture further clarifies academic honesty within the specific setting of design education. The following acts are considered to be academic dishonesty:

1. **Plagiarism/misrepresentation**

    There shall be no question of what your work is and what someone else's is. This applies to all aspects of student performance, including but not limited to
    -   CAD drawings and construction details
    -   design guidelines (written and graphic)

    -   design, planning, and management projects or portions of projects

    -   class reports and papers (again, both written and graphic information)

- any assignment where sole authorship is indicated, such as take-home tests, individual projects, etc.

Examples of inappropriate activities include:
- copying graphics for a report without crediting the original source

- representing someone else's work as your own (using existing CAD construction details, tracing drawings, etc.)

- allowing someone else to represent your work as his own

The importance of precedent and learning from past works is a necessary part of most design processes. Again, it is the intent and degree of "borrowing" ideas that is at question.

Anything not original must be paraphrased and cited, or quoted; using accepted style formats such as APA, MLA, Chicago Manual of Style, etc. This includes information obtained from the Internet, public documents, graphics, and personal interviews as well as more traditional written sources. Proper crediting of all information that is not common knowledge is necessary for academic honesty as well as for professionalism. (For example, analysis drawings and/or text should cite the sources from which data was obtained so that if questions arise later, they can be quickly and accurately answered.)

Multiple submissions of the same or similar work without prior approval
If the instructors understand that you are doing a paper associated with your thesis or senior project topic, then doing similar work for two different classes is acceptable—if the instructors agree to it. If a single paper is submitted for one class, then later is submitted for another, and the instructors expect original work, then the multiple submission is inappropriate.

2. **Falsifying information**

Examples include:

- misrepresenting reasons why work cannot be done as requested

- changing or leaving out data, such as manipulating statistics for a research project, or ignoring/hiding inconvenient but vital site information. (However, for educational purposes only, certain aspects of the "real world" may be jointly agreed upon as not being pertinent to the academic goals of the course, such as not dealing with specific project parameters or budget, changing the program, etc.)

- altering work after it has been submitted

- hiding, destroying, or otherwise making materials unavailable (hiding reference materials, not sharing materials with other students, etc.)

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see the Notification to Students of FERPA Rights.

Campus Resources:

Health and Wellness

U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress. **Counseling and Wellness Center:** counseling.ufl.edu/cwc, and 392-1575 for information on crisis services as well as non-crisis services; and the University Police Department: 392-1111 or 9-1-1 for emergencies. **Sexual Assault Recovery Services (SARS)** Student Health Care Center, 392-1161. **University Police Department** at 392-1111 (or 9-1-1 for emergencies), or police.ufl.edu.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. **Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. **Library Support**, Various ways to receive assistance with respect to using the libraries or finding resources. **Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. **Writing Studio,** 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. **Student Complaints Campus,** Visit the Student Honor Code and Student Conduct Code webpage for more information. **On-Line Students Complaints,** View the Distance Learning Student Complaint Process

Orlando Resources

Police / Fire / Medical Emergency – 911 Orlando Police Department Non-Emergency Number: 321.235.5300 Consult CityLab-Orlando Student Resources for Emergency contact information.