

SCHOOL OF ARCHITECTURE GRADUATE AI CERTIFICATE



CERTIFICATE | NEW REQUEST

INFORMATION

Request: New Graduate Certificate in Artificial Intelligence in Architecture

Description of request: The College of Design, Construction, and Planning seeks to create a new graduate certificate in Artificial Intelligence in Architecture.

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Form version: 1

Certificate Name: AI in Architecture

Transcript Title: Certificate in AI in Architecture

Credits: 15 credits

Level: Graduate

CIP Code: 04.0201

Degree Program: Architectural and Building Sciences/Technology

Effective Term: Fall

Effective Year: 2024

CERTIFICATE DESCRIPTION

The AI in Architecture Graduate Certificate offers a comprehensive and logical progression of courses aimed at equipping students with a strong foundation in coding and computation, as well as the theoretical and practical applications of AI and data-driven algorithms in architectural practices. With a comprehensive AI education, our students will gain a competitive edge in the job market. The Certificate will provide accessible, high-quality hybrid AI in Architecture education, making it possible to bridge the AI skills gap and equip students and professionals with the knowledge and skills they need to succeed in this rapidly evolving field.

Students enrolled in the Master of Architecture may add the Graduate Certificate in Artificial Intelligence in Architecture. The certificate shares 9 credit hours with the Master of Architecture degree. It does not add credit hours or time to a track one (advanced program, 52-credit) Master of Architecture degree. The Graduate Certificate in Artificial Intelligence in Architecture when stacked with the Master of Architecture degree requires that the thesis or PILOT required for the Master of Architecture degree be focused on an AI topic.

REQUIREMENTS FOR ADMISSION

- Applicants to this graduate certificate must have earned a bachelor's degree from an accredited US institution or international equivalent in Architecture, Arts, Computer & Information Science & Engineering, Electrical & Computer Engineering, or related fields.

or

Current UF graduate students in Architecture, Arts, Computer & Information Science & Engineering, Electrical & Computer Engineering, or related fields.

or

Working professionals in Architecture, Arts, Computer & Information Science & Engineering, Electrical & Computer Engineering, or related fields.

- Applicants must have obtained a bachelor's degree or better and a minimum upper-division GPA of 3.0 from a regionally accredited institution or an international equivalent institution. Students may pursue just the graduate certificate without applying as master's degree-seeking students within the graduate program. These courses may not be applied to another certificate program (per UF policy).

REQUIREMENTS FOR COMPLETION

Consistent with longstanding Graduate Council policy, the only passing grades for students in a Graduate Certificate program are A, A-, B+, B, B-, C+, C, and S.

All coursework for the Graduate Certificate must meet a minimum overall 3.0 GPA (truncated).

Coursework and credits used for a UF Graduate Certificate may also be used to fulfill some requirements for a UF graduate degree, subject to existing Graduate School policy and with the approval of the academic unit offering the graduate degree program. Students will be made aware that only 15 credits taken in the certificate program may potentially be transferred toward a master's degree. As such, they will be strongly encouraged to apply to the master's program before their final semester in the certificate. Otherwise, they will be required to take an additional course in the master's program to fulfill the graduation requirement.

Following traditional Transfer of Credit policy and procedures, up to 6 credits earned with a grade of B or better may be considered for transfer credit toward a future graduate degree provided.

The Graduate AI and Architecture Certificate requires a total of **15 credit** hours to complete the certificate. **9 credits** are required from the following ARC courses:

ARC 5XXX – Fundamentals of Coding and Computation – Spring – 3 credits

ARC 6XXX – Clock and Clouds - Fall and Spring – 3 credits

ARC 6XXX – Machine Learning for Architects – Fall – 3 credits

Students can take the remaining **6 credits**, from any of the following clusters:

Architecture Cluster

ARC 6356 – Playing Models Design Studio - Fall G3 – 6 credits

ARC 6979 – PILOT AI – Spring – 6 credits

ARC XXXX – Thesis AI – Spring – 6 credits

Arts Cluster

HUM XXXX – Algorithmic Creativity – Fall – 3 credits

HUM XXXX – Topics & Perspectives - AI, Art & Society – Fall – 3 credits

Data Science Cluster

CAP 5771 – Introduction to Data Science - Fall – 3 credits

COT 5405 – Analysis of Algorithms - Spring – 3 credits

COP 5536 – Advanced Data Structures - Spring – 3 credits

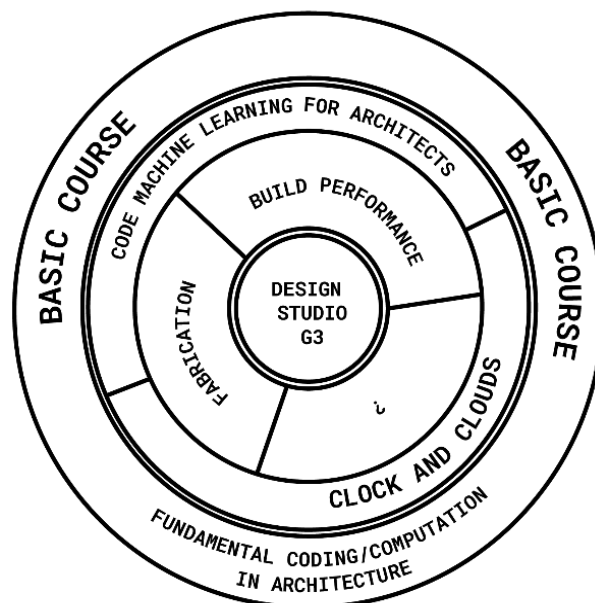
Artificial Intelligent Cluster

CAP 5635 – Artificial Intelligence Concepts - Fall – 3 credits

EEL 5840 – Fundamentals of Machine Intelligence - Spring – 3 credits

RATIONALE AND PLACE IN CURRICULUM

As technology continues to propel advancements in the built environment, students studying architecture stand to gain immensely from a solid understanding of AI and its practical uses. The School of Architecture is dedicated to empowering its students with the necessary expertise and competencies to thrive both academically and professionally. Through the AI certificate program, our objective is to offer graduate students a specialized certification focusing on the application of AI and Machine Learning within architecture. This initiative aims to furnish students with the essential skills required to excel in the swiftly evolving landscape of architectural practice.



CERTIFICATE STRUCTURE

STUDENT LEARNING OUTCOMES

The AI Certificate developed 4 new classes at the School of Architecture to cover subjects ranging from Theory to Practice. The courses meet the requirements identified by the university AI Task Force, with measurable goals and outcomes for future assessment: AI Enrichment, AI Ethics, Use & Apply AI, Evaluate & Create AI. The Student Learning Outcomes are met using the 9 credit hours, 3 of the new courses' coursework.

- ARC 5XXX – Fundamentals of Coding and Computation – 3 credits

This course will **teach** 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.

- ARC 6XXX – Clock and Clouds – 3 credits

This course will **examine** the limitations and opportunities of Bias and Fairness in the practice of architecture using AI. This course fulfills university requirements to be categorized as “**AI Ethics**”. Students will **construct** theoretical and philosophical questions related to AI and data-driven algorithms in design and will examine bibliographic works to support their hypotheses in response to the questions. In their final project, students will **create** course syllabi for the first year of architecture studies, taking AI as a ground infrastructure in the curriculum.

- ARC 6XXX – Machine Learning for Architects - 3 credits

This course will focus on **experimentation** and **application**. Students will **apply** the most common state-of-the-art AI and Machine Learning (ML) algorithms and game engines in architectural design. Emphasizing AI as a paradigm for critical thinking and idea development, not just optimization. This course will fulfill university requirements to be categorized as “**Use & Apply AI**”

The remaining 6 credits add additional reinforcement within a range of outcomes.

- ARC 6356 Playing Models - 6 credits

This design studio course is fundamental to architectural education. Students will **combine** different AI algorithms to **create** solutions for real-world design projects. This course will fulfill university requirements to be categorized as **“Use & Apply AI”**.

PILOT projects or the Final Thesis: Students can **develop** research projects utilizing AI applications for their PILOT or Thesis. If the projects include a section utilizing AI, the credits can be counted towards the AI and Architecture Certificate. This course fulfills university requirements to be categorized as **"Use & Apply AI"**.

To ensure a well-rounded curriculum, other courses will be outsourced from other schools within the University of Florida (UF), such as the College of Arts, and the College of Engineering. These courses will delve into the specific application of AI in different areas, such as engineering, data science, fabrication, building performance, theater, art, music, etc. These courses will fulfill the **“Evaluate & Create AI”** category requirements.

Outcome Map Key:

I = Introduced

E = Emphasized

R = Reinforced

A = Advanced

Students solve design problems by applying code (AI Enrichment).

(I, E) ARC 5XXX – Fundamentals of Coding and Computation.

Students critically evaluate theoretical and philosophical questions in (design) architectural practices raised by AI and data-driven algorithms (AI Ethics).

(I, E) ARC 6XXX – Clock and Clouds.

(R, A) ARC 6XXX – Machine Learning for Architects.

Students devise approaches to solve architectural design problems by applying state-of-the-art AI and Machine Learning (ML) algorithms (Use & Apply AI).

(I, E) ARC 5XXX – Fundamentals of Coding and Computation

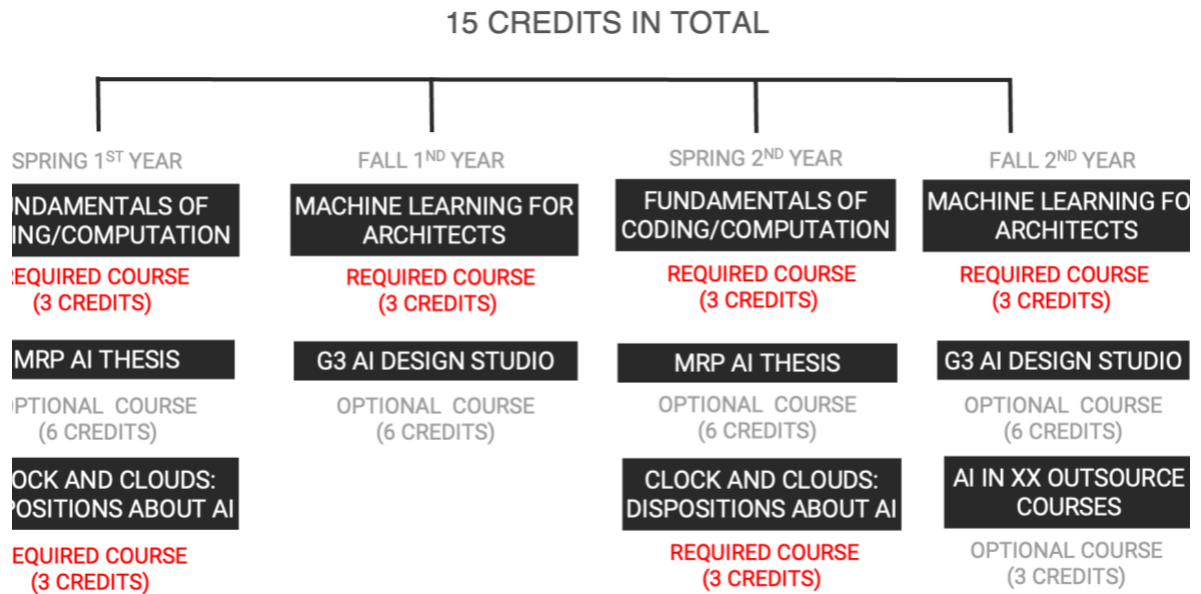
(E, R) ARC 6XXX – Machine Learning for Architects

Students propose and design AI research methods to approach viable architectural design questions (Evaluate & Create AI).

(I, E) ARC 5XXX – Fundamentals of Coding and Computation

(E) ARC 6XXX – Clock and Clouds

(R, A) ARC 6XXX – Machine Learning for Architects



TIMELINE

COURSE CONTENT AND POSTERS



ARC 5XXX - Fundamentals of Coding and Computation: This core course will delve into the fundamentals of coding, introducing students to concepts such as variables, conditions, loops, algorithms, and libraries. These concepts will then be applied in design exercises to give students a hands-on understanding of how coding can solve design problems. This course will fulfill university requirements to be categorized as **"AI Enrichment"**.



ARC 6XXX – Clocks and Clouds: This course fulfills university requirements to be categorized as an **"AI Ethics"** course. Students will explore and evaluate the use of AI and data-driven algorithms in architectural practices. They will develop course syllabi for the first year of architecture studies, taking AI as a ground infrastructure in the curriculum, addressing fairness, bias, and copyright for work produced with AI



ARC 6XXX Machine Learning for Architects: The course will focus on experimentation and application. Students will learn about the most common AI and Machine Learning (ML) algorithms used in design exercises and how they can apply them in architectural design. This course will fulfill university requirements to be categorized as **"Use & Apply AI"**.



ARC 6356 Fluid-Playing Models: This is a foundational course within architectural education. This course will challenge students to apply their knowledge and skills acquired from previous courses to real-world design projects. This course will fulfill university requirements to be categorized as **"Use & Apply AI"**

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KARLA S., RICCARDO V.

CLOCK AND CLOUDS: DISPOSITION ABOUT AI

3 credits

- W01. Introduction: Artificial Intelligence and Architectonic Disposition.
- W02. Gardening Images. Production, Consumption, Photosynthesis.
- W03. Clouds and Clocks: Ethics in Architecture.
- W04. Model, Map, Territory.
- W05. Information Theory: Entropy, Negentropy, Code.
- W06. Tools and Instruments. Imperative Programming and Declarative Coding.
- W07. Artificial Intelligence: Tool and/or Instrument?
- W08. Articulating Dispositions: "Inventing" the Architectural Intent.
- W09. Testing of the Architectural Intent.
- W10. Testing of the Architectural Intent.
- W11. Final Projects and Round Table.



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KARLA S., ZIFENG G., LEE-SU H.

FUNDAMENTALS OF CODING AND COMPUTATION

3 credits

W01.	What is coding?
W02.	Variables
W03.	Control-flow
W04.	Conditionals
W05.	Loops
W06.	Data structures
W07.	Algorithms
W08.	Libraries
W09-11.	Final Project



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KARLA S., JIMMY W.

CODE MACHINE LEARNING FOR ARCHITECTS

3 credits

W01.	Data and Information
W02.	What is Artificial Intelligence
W03.	Data collection
W04.	Data processing
W05.	Machine Learning
W06.	Supersize learning
W07.	Unsupervised learning
W08.	Generative Algorithms
W09.	Chat GPT and DALL-e
W10-11.	Application: code about generative algorithms and students work.



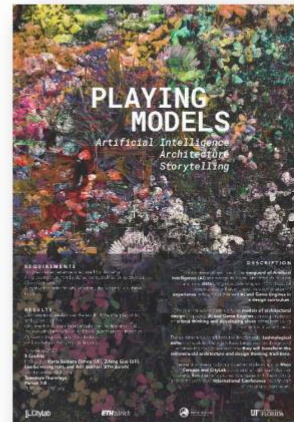
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KARLA S. JIMMY W.

G3 DESIGN STUDIO PLAYING MODELS

6 credits

- W01. Site analysis (SOM, satellite images)
- W02-3. User needs in Social media analysis (SOM FE)
- W04-5. Mapping with Gis and drafting - research topic (archGIS)
- W06. Point cloud models (Could compare)
- W07-8. Design Exercise
- W01-10. 3D details navigation (SOM Fourier, and use GANS for image creation)
- W011. Precedent analysis (search engines in architecture)
- W12-13. Generative algorithms (CEM)
- W14. Unreal visualization



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HASSAN

AI IN BUILDING PERFORMANCE

3 credits

- W01. AI in building performance simulation and prediction
- W02. AI in building energy management and consumption
- W03. AI in HVAC system control and energy consumption
- W04. AI in building noise control
- W05. AI in lighting control



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LEE-SU

AI IN FABRICATION

3 credits

- W01. AI in Interactive Design
- W02. AI in Robotics (w/ BCN: Aladdin Alwisy)
- W03. AI in Image Recognition / Point Cloud Segmentation
- W04. Augmented Reality-Assisted Robotic Fabrication
- W05. Augmented Reality-Assisted Assembly

