CA5201: ADVANCED ARCHITECTURAL DESIGN STUDIO: DIGITAL ARCHITECTURE

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Advanced Architectural Design Studio: Digital Architecture

Subject Code
CA - Civil and Architectural Engineering
Course Number
5201

Academic Unit
Architecture and Civil Engineering (CA)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
6

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The themed studio series includes four different studio foci; it aims to provide students with a studio environment to explore areas of their own interest and prepare them to formulate their independent study in the Architectural Thesis Studio.

This studio focuses on applying AI and Digital tools to explore architectural design. Recently, with the rapid development of Stable Diffusion and its series of control plugins, Artificial Intelligence (AI) has undergone a qualitative mutation in architectural design. In this course, we will use the latest generative AI techniques and train and practice creative AI models for architectural design. We will start with the theoretical introduction and literature interpretation of artificial intelligence combined with design, covering architecture, cities, structures, art design, and other fields. At the same time, we will introduce the computer theory of AI and feature engineering to expand students' knowledge systems. Next, we will introduce the training and application of generative AI models to deploy Stable Diffusion, LoRA, and ControlNET. Finally, students will work on a personal design and research project to train and test AI models with specific architectural design topics.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Apply advanced digital tools and techniques to create innovative architectural designs that address complex spatial and functional requirements.			x	x
2	Analyze and evaluate the impact of digital technologies on architectural practice, including sustainability, efficiency, and user experience.			x	
3	Critically assess and integrate emerging digital design methodologies to enhance architectural creativity, expression, and communication.		x	x	
4	Collaborate effectively in multidisciplinary teams to develop comprehensive digital architectural proposals, considering social, cultural, and contextual factors.		x	x	
5	Create professional presentation and documentation of a design project			x	x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Design Studio	Students will engage in the studio to use digital design methods to develop an architectural or urban design project.	1, 2, 3, 4, 5	

Additional Information for LTAs

Semester Hours: 6 hours per week

Lecture/Tutorial/Laboratory Mix: Lecture (0); Tutorial (0); Laboratory (6*)

*Studio

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4, 5	100	Design project

Continuous Assessment (%)

100

Examination (%)

0

Assessment Rubrics (AR)

Assessment Task

Assignments (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Attitude to demonstrate an understanding of digital design and artificial intelligence;
Ability to use digital design methods and techniques to develop a project on architectural and urban design;
Ability to prepare high-quality design representation with diagrams and renderings.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Assignments (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Attitude to demonstrate an understanding of digital design and artificial intelligence;
Ability to use digital design methods and techniques to develop a project on architectural and urban design;
Ability to prepare high-quality design representation with diagrams and renderings.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Architectural design, Design studio, Digital design, Artificial intelligence, Digital tools and techniques, Architectural representation and documentation.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Snyder V. Refabricating Architecture: How Manufacturing Methodologies are Poised to Transform Building Construction[J]. 2005.
2	Caneparo L, Cerrato A. Digital fabrication in architecture, engineering and construction[M]. Springer Netherlands, 2014.
3	Williams K. Digital Fabrication[M]//Digital Fabrication. Birkhäuser, Basel, 2012: 407-408.
4	Iwamoto L. Digital fabrications: architectural and material techniques[M]. Princeton Architectural Press, 2013.
5	Frazer J. An evolutionary architecture[J]. 1995.
6	Dunn N. Digital fabrication in architecture[M]. Laurence King Publishing, 2012.
7	Mazzoleni I. Architecture follows nature-biomimetic principles for innovative design[M]. Crc Press, 2013.
8	Pohl G, Nachtigall W. Biomimetics for Architecture & Design: Nature-Analogies-Technology[M]. Springer, 2015.
9	Terzidis K. Algorithmic architecture[M]. Routledge, 2006.
10	Architectural Design 0403 emergences
11	Architectural Design 0602 Mophogenetic Design
12	Steenson M W. Architectural intelligence: How designers and architects created the digital landscape[M]. mit Press, 2022.
13	Leach N. Design in THE age of artificial intelligence[J]. Landscape Architecture Frontiers, 2018, 6(2): 8-20.
14	Picon A. Digital culture in architecture[M]//Digital Culture in Architecture. Birkhäuser, 2010.
15	Agkathidis A. Generative design[M]. Hachette UK, 2016.

16	Negroponte N. Soft architecture machines[M]. Cambridge, MA: MIT press, 1975.
17	Carpo M. The alphabet and the algorithm[M]. Mit Press, 2011.
18	Negroponte N. The architecture machine[J]. Computer-Aided Design, 1975, 7(3): 190-195.
19	The digital turn in architecture 1992-2012[M]. John Wiley & Sons, 2012.
20	Carpo M. The second digital turn: design beyond intelligence[M]. MIT press, 2017.