國立台灣科技大學 114學年 第2學期 課程大綱

Spring 2026 NTUST Course Outline

授課教師：施宣光,
陳秀杏

Instructor:SHIH, Shen-Guan,hsiuhsing Chen

課程名稱：建築設計模擬與運算

Course Title：Architectural Design Simulation and Computation

2026/11/3

課程代號： AD3705701 Course Code	必選修：選修/半學年 Required/Electve:Elective/Half Yr.
學分數： 3 Credits	先修課程： Prerequisites

節次教室： Time/Location	F2(RB-508) F3(RB-508) F4(RB-508)
專業核心能力： Core Professional Competencies	2.具備使用專業媒體、工具與設備的能力 3.具備專業資訊統合與管理概念 4.具備建築工程技術概念
課程網址： Course Website	https://moodle2.ntust.edu.tw/course/view.php?id=17607
課程宗旨： Course Objectives	Architectural design increasingly relies on computational workflows to explore, evaluate, and communicate design decisions. This course introduces design simulation and computation as an integrated approach for developing multi-objective architectural systems, with an emphasis on building envelopes and structural systems. Students will use Blender with Bonsai (IFC/BIM) and Geometry Nodes to build information-rich models, develop parametric/procedural design systems, and run digital simulations to compare alternatives in terms of aesthetics, constructability, cost, and energy performance. Throughout the semester, students will engage in hands-on exercises and project-based learning, combining parametric modeling, digital twin concepts, and AI-assisted workflows to support iterative design refinement and evidence-based decision making. By the end of the course, students will be able to: 1. Create and manage IFC-based building information models in Blender/Bonsai (e.g., LOD 100–200). 2. Develop parametric/procedural design systems using Geometry Nodes. 3. Apply basic physical and performance simulations to evaluate design alternatives and produce clear visualizations/animations. 4. Use AI tools responsibly to support ideation, iteration, and multi-objective refinement (aesthetics, cost, energy). 5. Communicate design intent and performance results through an analysis report and final presentation.
課程大綱： Outline of Lectures	

	Week 1 (Self-paced): Course onboarding + workflow setup Week 2: Blender practice — architectural massing on a given site (common space, residential mass, service core) Week 3: Bonsai/IFC setup — project hierarchy, storeys, grids, initial structural model Week 4: Structural physics simulation I — rigid bodies + collisions Week 5: Structural physics simulation II — constraints/joints + stability Week 6 (Self-paced): Consolidation week — model cleanup, IFC naming, simulation stability practice Week 7 (Midterm): Midterm presentation — structural system physics simulation + visualization Week 8: Geometry Nodes I — fundamentals and parameter control Week 9: Geometry Nodes II — rule-based variants and comparisons Week 10 (Self-paced): Nano Banana — façade concept generation using structural model references Week 11: MCP + Claude — translate AI images into a draft building envelope system Week 12: Unitized envelope design — unit module + joints + repeat logic Week 13: Envelope evaluation — cost proxy, R-value proxy, summer heat gain proxy Week 14: Flexible studio — iteration + report structure + figures Week 15: Flexible studio — finalize model, evaluation, and presentation materials Week 16 (Final): Final presentation + submission of final package
授課方式： Method of Instruction	講授 Lecture：30% 分組討論 Group discussion：30% 案例研討 Case study：10% 操做練習 Practical exercises：30% 講授 Lecture：This course is taught through a combination of lectures, hands-on workshops, computational modeling exercises, and project presentations. The emphasis is on integrating procedural modeling and generative AI techniques into architectural design, particularly for building envelopes.%
教科書： Textbooks	NA
參考書目： References	Blender tutorial https://www.youtube.com/watch?v=B0J27sf9N1Y&list=PLjEaoINr3zgEPv5y--4MKpciLaoQYZB1Z Blender BIM https://blender-addons.org/blenderbim-addon/
修課須知： Notice	Course introduction https://docs.google.com/document/d/1iLgN5fiBth32w_AvwbDBifelW63elAva/edit?usp=sharing&ouid=106908614727598164833&rtpof=true&sd=true
評量方式： Grading	Participation 20% Home works 0% Mid-term report 30% Semester project (teamwork) 50%
備註說明： Notes	Recommended Preparatory Work Self-paced learning on Blender modeling and Geometry Nodes through online resources. Reviewing case studies of generative façade design to understand applications of computational methods.