

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  
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Course Title : Architectural Design  
Simulation and Computation

2026/5/6

<p>課程代號：AD3705701 Course Code 學分數：3 Credits</p>	<p>必選修：選修/半學年 Required/Elective: Elective/Half Yr. 先修課程： Prerequisites</p>
<p>節次教室：F2(RB-508) F3(RB-508) F4(RB-508) Time/Location</p>	
<p>專業核心能力：2.具備使用專業媒體、工具與設備的能力 Core Professional Competencies 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</p>	
<p>課程網址：<a href="https://moodle2.ntust.edu.tw/course/view.php?id=17607">https://moodle2.ntust.edu.tw/course/view.php?id=17607</a> Course Website</p>	
<p>課程宗旨：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.</p>	
<p>課程大綱： Outline of Lectures</p>	

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：** 講授 Lecture : 30%  
**Method of Instruction** 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：** NA  
**Textbooks**

**參考書目：** Blender tutorial  
**References** <https://www.youtube.com/watch?v=B0J27sf9N1Y&list=PLjEaoINr3zgEPv5y--4MKpciLaoQYZB1Z>  
 Blender BIM  
<https://blender-addons.org/blenderbim-addon/>

**修課須知：** Course introduction  
**Notice** [https://docs.google.com/document/d/1iLgN5fiBth32w\\_AvwbDBife1W63elAva/edit?usp=sharing&oid=106908614727598164833&rtpof=true&sd=true](https://docs.google.com/document/d/1iLgN5fiBth32w_AvwbDBife1W63elAva/edit?usp=sharing&oid=106908614727598164833&rtpof=true&sd=true)

**評量方式：** Participation 20%  
**Grading** Home works 0%  
 Mid-term report 30%  
 Semester project (teamwork) 50%

**備註說明：** Recommended Preparatory Work  
**Notes** 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.