INTERNATIONAL QUALIFICATIONS

AND ASSESSMENT CENTRE (IQAC)

«Approved»

2025 y. «___» _____

Programme	**Level 7 Diploma in Architecture**		
Unit Number/ Unit Title	**Unit 2 Computational Design and Digital Fabrication**		
Cohort Code:	L07CDDF-U2		
Unit Level	7		
Total Credits/Hours	Total qualification time 200/ Total Guided learning hours 90/ Self-guided learning hours 110		
Credits	20 CATS/ 10 ECTS		
Lecturer			
Start Date		**End Date**	

Unit Aims	This unit aims to equip learners with advanced skills in computational design tools and digital fabrication techniques. Emphasis is placed on parametric design, algorithmic modeling, scripting, and the use of digital fabrication tools such as CNC, 3D printing, and robotic arms. Students will explore the integration of computational processes into design workflows to enhance architectural innovation and precision.
Differentiation Strategies *(e.g. planned activities or support for individual learners according to their needs)*	Various approaches to addressing the various identified students' needs will be adopted throughout the lesson. Such will include: 1. Progressive tasks 2. Digital resources 3. Verbal support 4. Variable outcomes 5. Collaborative learning 6. Ongoing assessment 7. Flexible-pace learning

Equality & Diversity	Variety of teaching techniques will be employed to ensure that the needs of each individual learner are met.
Safeguarding & Prevent	Safeguarding policies and the Prevent duty are strictly observed to ensure the safety, well-being, and inclusivity of all students and staff.
Health & Safety	SIRM H&S policies will be maintained.
Learning Resources	**Teaching and Learning Materials** • Oxman, R. & Oxman, R. (2014). Theories of the Digital in Architecture. Routledge. • Kolarevic, B. (2003). Architecture in the Digital Age: Design and Manufacturing. Taylor & Francis. • Burry, M. (2011). Scripting Cultures: Architectural Design and Programming. Wiley. • Lynn, G. (1999). Animate Form. Princeton Architectural Press. • Gramazio, F., Kohler, M. & Langenberg, S. (2014). Fabricate: Negotiating Design and Making. UCL Press.

Learning Outcome (The learner will:)	Assessment Criteria (The learner can:)
LO1. Apply parametric and algorithmic design techniques to architectural problems.	Design Project: 1.1 Create dynamic design solutions using parametric tools (e.g., Grasshopper). 1.2 Implement custom algorithms or scripts to automate design processes.
LO2. Evaluate the role of computational design in enhancing sustainability and performance.	Research Report: 2.1 Analyse case studies where computational tools optimized energy or material performance. 2.2 Critique the environmental implications of digital fabrication processes.
LO3. Use digital fabrication tools to translate computational models into physical prototypes.	Practical Lab Submission: 3.1 Operate CNC, 3D printers, or robotic devices to fabricate design components. 3.2 Document the fabrication workflow and evaluate results.
LO4. Reflect on the integration of computational design within traditional architectural practice.	Reflective Essay: 4.1 Assess the challenges of adopting digital workflows in architectural studios. 4.2 Propose strategies for balancing innovation and craftsmanship.

No	Topic	Learning Outcomes for Each Topic	Which assessment criteria does the session relate to?	Day/month/ year/ signature
1	Introduction to computational design tools and workflows	Understand the role and scope of computational tools in the architectural design process.	LO1	
2	Principles of parametric thinking in architecture	Recognise how parametric logic influences design form and adaptability.	LO1	
3	Getting started with Grasshopper and Rhino	Use node-based interfaces for visual programming.	LO1	
4	Creating rule-based models using parametric inputs	Apply rules and constraints to generate flexible architectural geometries.	LO1	
5	Algorithmic form generation using visual programming	Develop complex geometries through algorithmic modelling techniques.	LO1	
6	Data-driven design: controlling parameters with external data	Integrate data inputs into parametric systems to inform design logic.	LO1	

7	Scripting basics: introduction to Python or C# in architecture	Understand basic scripting to extend modelling capabilities.	LO1	
8	Performance-informed design	Evaluate the impact of environmental data on computational form-making.	LO2	
9	Sustainability metrics in parametric workflows	Use tools to assess and optimise energy performance in early-stage design.	LO2	
10	Daylighting simulation integration	Interpret daylighting analysis to inform design modifications.	LO2	
11	Climate-responsive form generation	Generate site-specific design responses based on environmental conditions.	LO2	
12	Passive design strategies through computational tools	Apply digital techniques to incorporate passive systems in design.	LO2	
13	Introduction to digital fabrication: tools and principles	Identify fabrication methods and how they link to computational models.	LO3	
14	3D printing setup and workflow	Prepare and convert architectural models for 3D printing.	LO3	

15	Laser cutting from parametric designs	Use vector-based outputs for model-making.	LO3	
16	Midterm	**Midterm assessment** covering all learning outcomes (theory and practical elements)	LO1, LO2, LO3	
17	CNC milling and toolpath generation	Understand file preparation and machine requirements for CNC processes.	LO3	
18	Robotic fabrication: introduction and potential	Explore emerging applications of robotic arms in architectural assembly.	LO3	
19	Prototyping: from screen to material	Translate digital forms into tangible physical prototypes.	LO3	
20	Hybrid workflows: combining manual and digital fabrication	Integrate handcraft and digital processes in iterative model-making.	LO3	
21	Design for disassembly and material reuse	Evaluate sustainable digital fabrication strategies.	LO2, LO3	
22	Collaborative digital workflows (BIM + parametric tools)	Understand how computational tools support interdisciplinary collaboration.	LO4	

23	Custom components and plugins for parametric tools	Extend tool capability through user-created or community plugins.	LO1, LO4	
24	Critical reflection: limits of algorithmic design	Evaluate when and how computational design is appropriate.	LO4	
25	Ethics in digital fabrication and automation	Understand ethical implications of digital production in architecture.	LO4	
26	Documenting the computational design process	Use diagrams and annotations to communicate workflows and intent.	LO4	
27	Visualising computational work for presentation	Create clear and compelling visuals from complex design models.	LO4	
28	Preparing digital portfolios for parametric design	Organise and present computational work professionally.	LO4	
29	Final project development (computational design challenge)	Apply full design process from algorithm to fabrication in a small project.	LO1 – LO4	
30	Fabrication and presentation of final prototype	Produce and showcase a resolved physical output of the design.	LO3, LO4	

31	Final review and reflection	Critically reflect on design decisions, tools used, and learning process.	LO4	