INTERNATIONAL QUALIFICATIONS

AND ASSESSMENT CENTRE (IQAC)

Approved

2025 y. «16» 07

Programme	**Level 5 Extended Diploma in Architecture**		
Unit Number/ Unit Title	**Unit 7 Environmental systems and Building Performance**		
Cohort Code:	L05ESB-U7		
Unit Level	Level 5		
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 explores how environmental systems—such as heating, ventilation, lighting, and water— affect building design and performance. Students will learn to integrate passive and active design strategies, with an emphasis on energy efficiency, sustainability, and occupant wellbeing.
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** • Szokolay, S. V. (2014). Introduction to Architectural Science. Routledge. • Watson, D., & Labs, K. (2003). Time-Saver Standards for Architectural Design Data. McGraw-Hill. • Lechner, N. (2014). Heating, Cooling, Lighting: Sustainable Design Methods for Architects. Wiley. • Hegger, M. et al. (2007). Energy Manual: Sustainable Architecture. Birkhäuser. • Givoni, B. (1998). Climate Considerations in Building and Urban Design. Wiley.

Learning Outcome	Assessment Criteria
LO1. Explain the principles of thermal comfort, lighting, acoustics, and indoor air quality.	**1. Written Exam:** **1.1 Define environmental performance criteria for buildings.** **1.2 Interpret regulations and performance standards.**
LO2. Analyse and evaluate active and passive environmental systems in building design.	**2. Case Study Analysis:** **2.1 Compare HVAC systems, renewable energy integration, and passive cooling techniques.** **2.2 Assess system suitability for specific building types.**
LO3. Integrate environmental performance strategies into architectural design.	**3. Design Report:** **3.1 Propose design adaptations for improved daylighting, ventilation, and energy use.** **3.2 Justify material and technology choices based on environmental data.**
LO4. Use digital simulation tools to predict building performance.	**4. Practical Lab Work:** **4.1 Model thermal and daylight performance using tools like ClimateStudio or IES VE.** **4.2 Interpret simulation results to inform design decisions.**

Week	Topic	Learning Outcomes for Each Topic	Which assessment criteria does the session relate to?	Day/month/ year/ signature
1	Introduction to Environmental Systems and Building Performance	Understand the scope and significance of environmental systems in architecture.	LO1	
2	Thermal Comfort – Principles and Design Implications	Explain factors affecting thermal comfort and how they guide design.	LO1	
3	Indoor Air Quality and Ventilation Basics	Identify key indoor air quality parameters and natural ventilation methods.	LO1	
4	Acoustics in Architectural Design	Study noise control and sound absorption strategies for building interiors.	LO1	
5	Lighting Fundamentals – Natural and Artificial	Explore the effect of lighting on occupant well-being and energy use.	LO1	

6	Passive Design Strategies – Orientation and Form	Analyse how building shape and site orientation reduce energy loads.	LO2	
7	Shading Devices and Solar Control	Evaluate passive shading systems for controlling solar gain.	LO2	
8	Thermal Mass and Insulation Materials	Study material properties that enhance thermal performance.	LO2	
9	Natural Ventilation Systems and Stack Effect	Design strategies to improve airflow using passive techniques.	LO2	
10	Daylighting Techniques and Glazing Types	Assess window design and light distribution for visual comfort.	LO2	
11	Water Efficiency and Rainwater Harvesting	Investigate systems for conserving water in building design.	LO2	
12	HVAC System Components and Operations	Understand mechanical systems for heating, ventilation, and cooling.	LO2	
13	Heat Pumps, Boilers, and Energy Distribution	Compare different mechanical heating technologies.	LO2	
14	Smart Building Technologies and Sensors	Examine automation tools for monitoring indoor environments.	LO2	
15	Integrating Passive and Active Strategies	Develop a holistic approach to sustainable building design.	LO3	

16	Midterm	**Midterm assessment** covering all learning outcomes (theory and practical elements)	LO1, LO2, LO3	
17	Envelope Design and Airtightness	Optimise the building envelope for thermal efficiency.	LO3	
18	Energy Codes and Environmental Certifications	Apply LEED, BREEAM, and local standards to evaluate building performance.	LO3	
19	Climate Analysis and Design Adaptation	Use local climate data to inform system selection.	LO3	
20	Designing for Thermal Zoning	Plan layouts to manage energy use and occupant comfort.	LO3	
21	Green Roofs and Vertical Gardens	Integrate nature-based systems to improve building performance.	LO3	
22	Building Energy Modelling Introduction	Learn basic concepts and goals of digital performance simulation.	LO4	
23	Simulation Tools – ClimateStudio or DesignBuilder	Apply tools to model daylight, energy, and comfort outcomes.	LO4	
24	Running a Daylight Analysis Simulation	Use software to visualise and assess light levels.	LO4	
25	Thermal Performance Simulation Techniques	Test energy loads and indoor temperatures using simulation.	LO4	

26	Building Performance Metrics and Benchmarks	Interpret energy use intensity (EUI), carbon footprint, etc.	LO4	
27	Comparing Simulation Results with Building Codes	Verify compliance and identify design improvements	LO4	
28	Performance-Based Design Decision Making	Use analysis to guide sustainable design choices.	LO4	
29	Iterative Testing of Environmental Systems in Design	Refine proposals using simulated feedback.	LO4	
30	Final Project – Performance-Driven Design Presentation	Present a building design with integrated environmental strategies and simulations.	LO1 – LO4	
31	Final Exam: Reflective Review – Evaluating Environmental Strategies	Document learning outcomes and assess effectiveness of environmental systems in design.	LO4	