## Appendix 1: Detailed Contents of the developed module

| **1. Climate, Sustainability, and Resources** | |
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| **Lectures (1.5 hr./lecture)** | **Details** |
| • **Lecture 1.1:** Climate: An Overview<br>• **Lecture 1.2:** Sustainability and Buildings<br>• **Lecture 1.3:** Energy and its Situation in Gaza<br>• **Lecture 1.4:** Renewable Energy<br>• **Lecture 1.5:** PVs and their Integration into Buildings | • Lecture 1.1: Climatic data (temperature, wind, RH, solar radiation), sun-path diagrams, classification of climates, Palestine climate, microclimate.<br>• Lecture 1.2: Sustainable architecture, global warming, climate change, greenhouse effect, the role of architects<br>• Lecture 1.3: Energy measurement, conventional energy resources, the energy situation in the Gaza Strip.<br>• Lecture 1.4: Overview of renewable energies (solar, wind, geothermal, hydro, biomass, biogas, tidal and wave energy).<br>• Lecture 1.5: PV systems, types, design, methods of integration into buildings. |
| **2. Thermal Comfort** | |
| **Lectures (1.5 hr./lecture)** | **Details** |
| • **Lecture 2.1:** Heat Transfer Mechanisms<br>• **Lecture 2.2:** Thermal Comfort (A)<br>• **Lecture 2.3:** Thermal Comfort (B)<br>• **Lecture 2.4:** Thermal Properties of Building Materials | • Lecture 2.1: The four bodily heat transfer mechanism.<br>• Lecture 2.2: Thermal comfort definition, thermal balance, comfort factors, indices and calculators.<br>• Lecture 2.3: Psychrometry charts and comfort zone.<br>• Lecture 2.4: U and R-Value, solar absorption, thermal lag, and thermal decrement. |
| **3. Basic Design Strategies for Energy Efficiency** | |
| **Lectures (1.5 hr./lecture)** | **Details** |
| • **Lecture 3.1:** Introduction to Passive Design<br>• **Lecture 3.2:** Thermal Insulation<br>• **Lecture 3.3:** Passive Cooling<br>• **Lecture 3.4:** Passive Heating<br>• **Lecture 3.5:** Climate-Responsive Design in Vernacular Architecture<br>• **Lecture 3.6:** Case Studies (A)<br>• **Lecture 3.7:** Case Studies (B) | • Lecture 3.1: Passive design definition and basic design techniques in different climates such as building form, orientation, glazing, and vegetation.<br>• Lecture 3.2: thermal insulation concept, thermal behaviour of insulated elements, insulator types, construction details.<br>• Lecture 3.3: Passive cooling: reducing heat gains (insulation, shading, etc.) and generating cooling potential (natural ventilation & evaporative cooling).<br>• Lecture 3.4: Passive heating: minimising heat losses, and increasing heat gains.<br>• Lecture 3.5: Study the climatic design of traditional buildings in Gaza and the Middle East.<br>• Lecture 3.6: Contemporary energy-efficient buildings.<br>• Lecture 3.7: Contemporary energy-efficient buildings. |
| **4. Assessment of Energy Efficiency in Buildings** | |
| **Lectures (1.5 hr./lecture)** | **Details** |
| • **Lecture 4.1:** Energy Rating Systems<br>• **Lecture 4.2:** Thermal Modelling Techniques | • Lecture 4.1: The role of energy efficiency directives (LEED, BREEAM, etc.).<br>• Lecture 4.2: An overview of the state-of-art of building thermal modelling techniques and indicators |
| **5. Lab Practice on Thermal Simulation** | |
| **Lectures (1.5 hr./lecture)** | **Details** |
| • **Lecture 5.1:** DesignBuilder Intro (A)<br>• **Lecture 5.2:** Practice (A)<br>• **Lecture 5.3:** DesignBuilder Intro (B)<br>• **Lecture 5.4:** Practice (B)<br>• **Lecture 5.5:** DesignBuilder Intro (C)<br>• **Lecture 5.6:** Practice (C)<br>• **Lecture 5.7:** DesignBuilder Intro (D)<br>• **Lecture 5.8:** Practice (D)<br>• **Lecture 5.9:** Practice (E)<br>• **Lecture 5.10:** Practice (F) | • Four lectures will introduce DesignBuilder to cover the following topics: Program's main tools, GUI, thermal simulation engine, the concept of thermal and non-thermal zones, drawing of openings, importing, materials assignment, zone settings definitions including HVAC and internal gains estimation, schedule management, etc. Five meetings are allocated for supervised practice of the program through exercises and term project. |