

**Med-Mobil project
workshop in August**

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Course scope

This course targets non-specialists participants in sustainable architecture and energy. The course lets the participants acquainted with the ways of utilizing renewable energy in favor of building running cost and human thermal comfort. It sheds light on passive and active design strategies. It also deals with computer analyses for building design using modern software for building behavior prediction.

Introduction:

Energy consumption in buildings is a major concern in architecture industry. Building occupants should be aware of every single mean of minimizing energy consumption through their architectural design. Moreover, buildings should highly utilize the available renewable energy resources such as wind energy and solar energy. Through building design, these resources of renewable energy can be benefited to minimize the energy consumption in buildings. This can be done by different ways and techniques, which should be reflected on building design. However, any possible treatment to make use of solar energy in buildings should be done to accommodate occupants in buildings in terms of physical conditions such as temperature degree, illuminance level, ventilation and other variables of bioclimatic design. It is essential that architects take climatic conditions as major influential factors on their buildings. To focus on this course, only solar energy will be handled as a major factor in building design with its all applications in buildings such as photovoltaic design, solar collectors, solar cooling, and solar heating.

Objectives:

The main objective of this course is to enhance participants' awareness of the effect of solar energy on building design and how it respects the principles of sustainable buildings. The course aims at teaching the participants ways and techniques to utilize solar energy in favor of heating and cooling loads in buildings. In this course solar energy will be a considerable factor in minimizing energy consumption in building

By accomplishing this course, the participants should appreciate and understand the following topics in sustainable buildings:

- Passive solar design
- Thermal mass in buildings
- Energy and Mass flows in Buildings
- Energy Saving in buildings
- Ventilation and cooling
- Principles of lighting
- Solar Gains

- Daylighting, artificial lighting
- Computer simulation of thermal performance in buildings.
- Making models for solar treatments.
- using recycling materials in model making.

Course contents:

1-introduction to solar energy

2-solar energy and orientation

- Daylight and building orientation*
- Solar heat absorption and building orientation*

3- Layout and zoning in building design

- Solar gain in spaces*
- Daylight factor and spaces.*

4- Solar system Design and treatment

- Solar treatment*
 - Sun breakers
 - Sun mask
 - Room location
 - Adjacent buildings
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- Building façade elements*
 - Reversible window
 - Low emissivity window
 - Venetian blinds
 - Thermo tropic glass
 - Double pane windows
 - Double skin facades.

6-Software application .

7-Applications on small-scale buildings (manual and software applications).

8-Real examples of solar buildings.

9- A trip to different projects and traditional buildings in Jordan that have clear climatic responsive buildings.

Additional Topics :

- 1- Traditional buildings in Jordan and sun breakers
- 2- Examples of modern buildings that take solar energy into consideration
- 3- Renowned architects and two or three examples of their buildings.
- 4- Photovoltaic and its applications in buildings
- 5- Solar collectors for heating water
- 6- Solar energy for cooling and heating
- 7- Sun breakers
- 8- Venetian blinds

List of references:

- 1- G. Z. Brown, **Sun, Wind & Light: Architectural Design Strategies**, 2nd Edition, Wiley, 2000.
- 2-Harris, Norman C., **Solar Energy Systems Design**, John Wiley and Sons, New York, 1985.
- 3-Stein, Benjamin, et al., **Mechanical and Electrical equipment for buildings**, seventh edition, John Wiley & Sons, 1992.
- 4-Norbert Lechner, **Heating, Cooling, Lighting: design methods for architects**, Wiley, New York, 2000.