

Renewable Energies Program: **Systems & Applications: Design, Control and Optimization**

1-Program Team:

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2-Program Description :

The summer university gives an introduction to various current technologies to harvest renewable energies (RE) including Photovoltaics (PV), Wind and Biomass. Some important applications such as the irrigation and water desalination will be presented.

Sizing, Control and Optimization of RE systems for building, heating, cooling, transport and industrial applications will be discussed.

Energy Quality measurements will be illustrated through a demonstration using a real case (PV Plant). Storage systems for smart grids, electric vehicle and Vehicle to Grid (V2G) concept will be presented.

Recent developments of small scale applications of piezoelectricity will be introduced along with new approaches using Artificial Intelligence (AI) and cognitive Engineering to analyze RE systems.

R&D paths to enhance the solar and wind systems performance will be presented, specially in desert environment including cell and PV module design, BEM formulation and modern wind turbines design.

A rich program has been put in place including lectures, demos, posters sessions, short students oral communications, and a visit to local solar installations.

3-Covered topics:

- Renewable energy harvesting technologies
- Solar energy applications
- Wind Energy, modern turbine Design
- Piezoelectricity and applications
- Biomass
- PV under desert environment
- RE systems sizing, control and Optimization
- Thermal solar technology (CSP)
- Energy Storage systems for Grid
- Electric Vehicle
- Artificial Intelligence Analysis of RE Systems

4 - Desired Learning Outcomes

Participants will learn about the main technologies used to harvest various renewable energies including solar, wind, biomass and piezoelectricity.

They will learn the main approaches used to control and optimize RE systems including Artificial Intelligence (AI) and cognitive engineering.

They will become familiar with the main industrial applications such as power generation using solar and wind, water desalination, irrigation in desert climates, heating, cooling and the concept of vehicle-to-grid systems.

5- Who Should Attend the Course ?

Faculty members and graduate students interested or working in the field of renewable energies, materials sciences, engineers, economists, information technology personnel who deal with any aspects of RE technologies, planning and operation.

Technical staff of Sonelgaz and energy companies could also benefit from this course.