



**Cairo University**  
**Faculty of Engineering**  
**Credit Hours System**



# **Electrical Energy Engineering Program**

## **EEE**



Scope



EEE  
Graduates



EEE  
Applications

2022



Graduation  
Projects



Decision

# Electrical Energy Engineers

1



## What we do?

**01** Develop, design or update specifications of electrical systems and equipment

**02** Design methods to generate, distribute and manage electricity

**03** Design automated and computerised methods to control industrial processes

**04** Manage and calculate the cost of projects, and materials needed

**05** Supervise the installation and maintenance of systems and equipment



# Electrical Energy Engineering

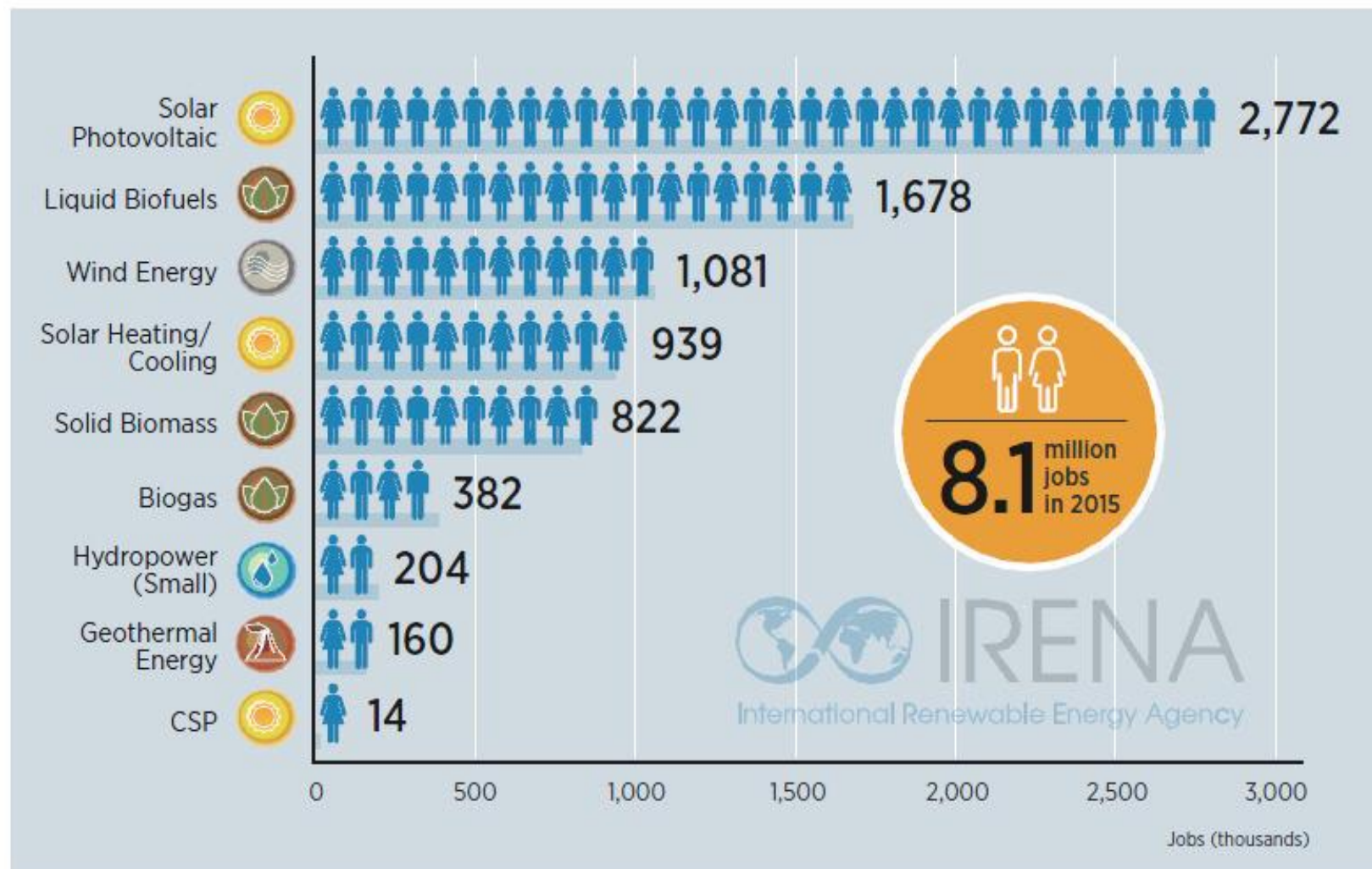
2



- Global transition into renewable and sustainable forms of energy.
- Worldwide trend for electrical applications for more energy saving and green economy.
- Constant growth of the local market for renewable energy and industrial automation.

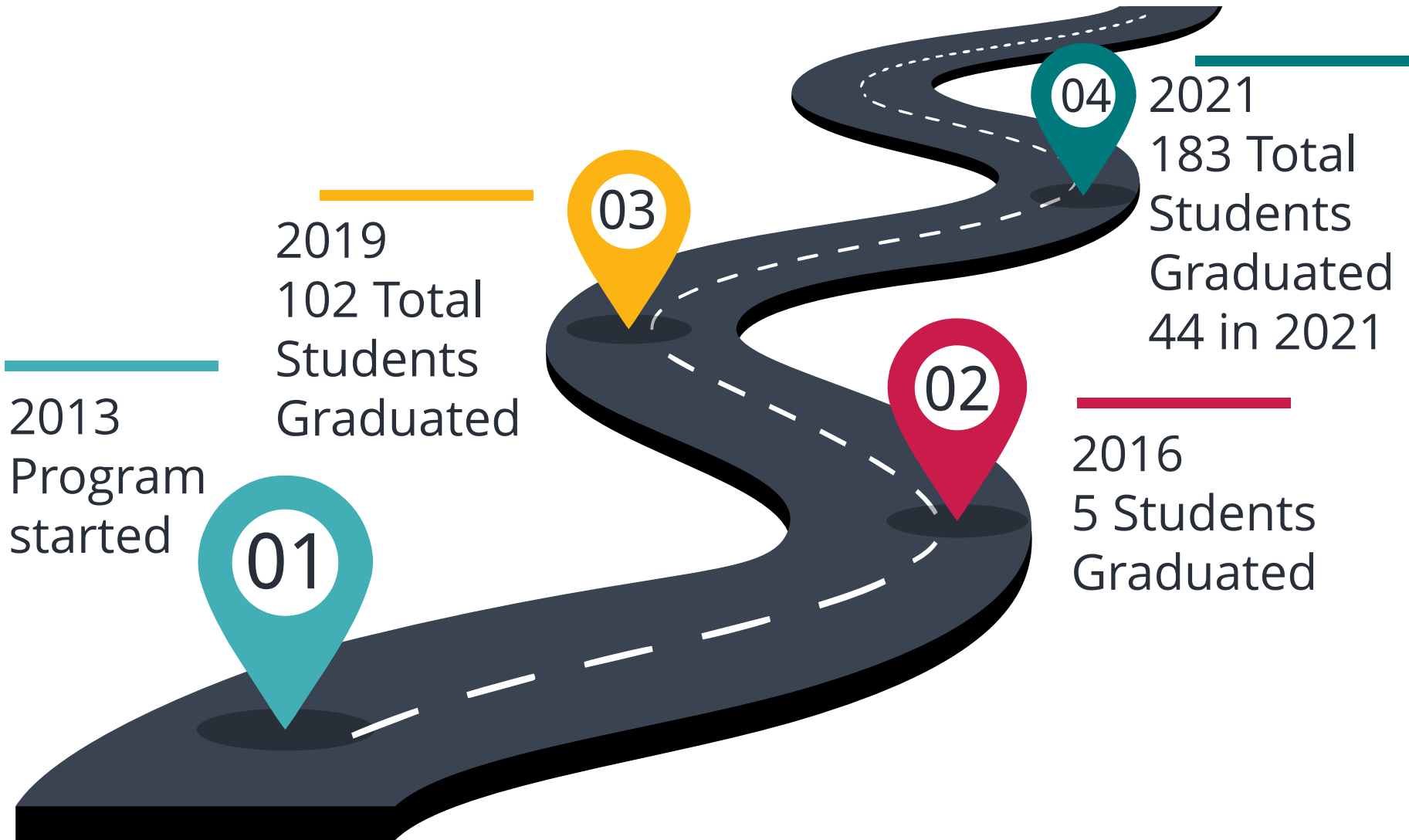
# Electrical Energy Engineering

FIGURE 1: RENEWABLE ENERGY EMPLOYMENT BY TECHNOLOGY

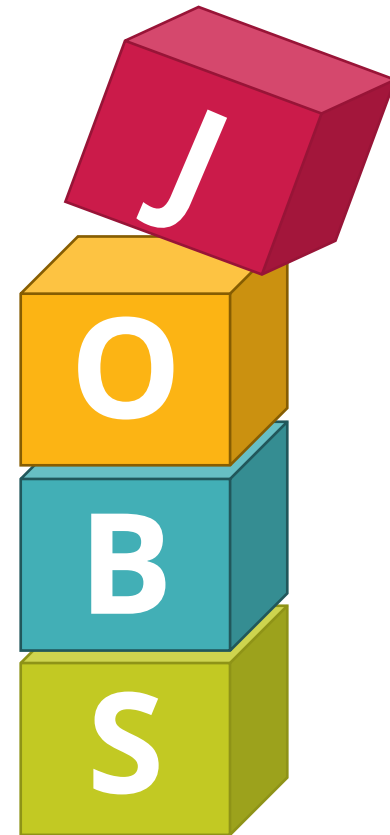
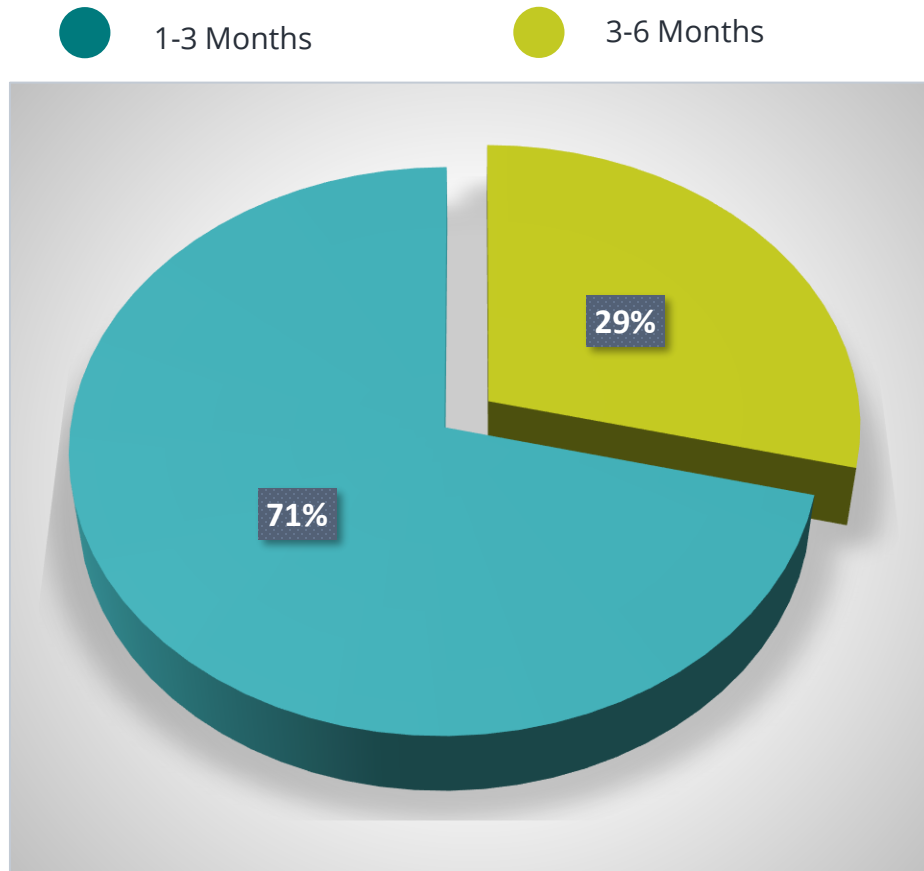


# EEE Milestones

4



# EEE Graduates



- **100% of our graduates were employed within 6 months of graduation.**
- **81% of their first jobs were EEE related**

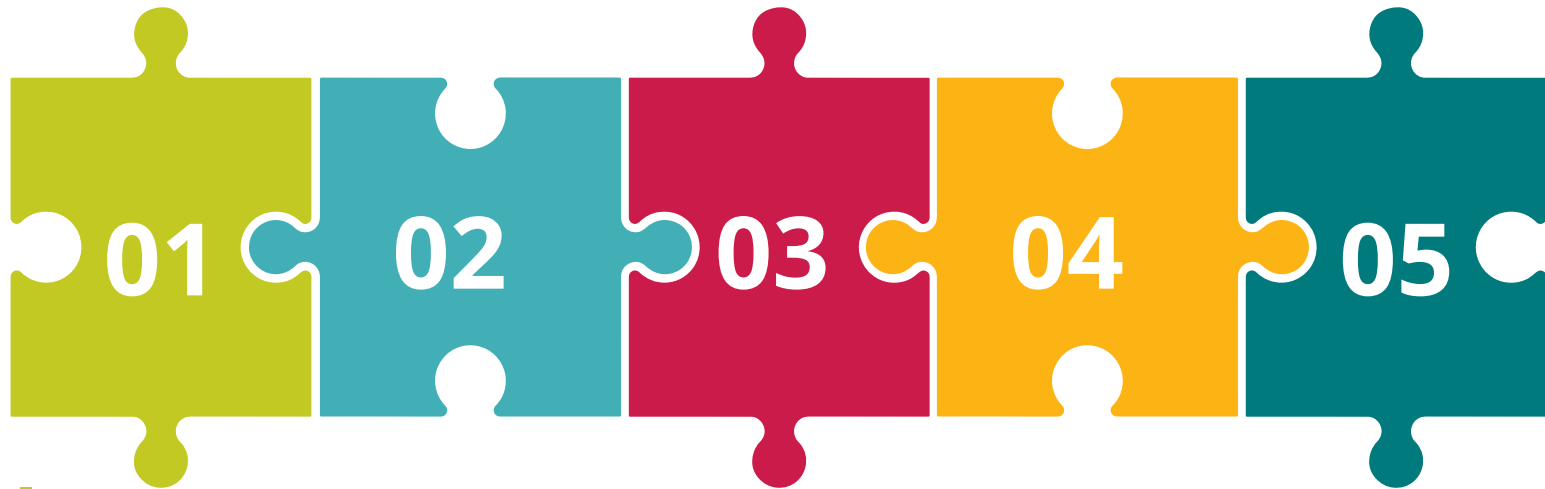
# EEE Graduates- December 2019





# Some Applications Related To **EEE** Program Curriculum

7



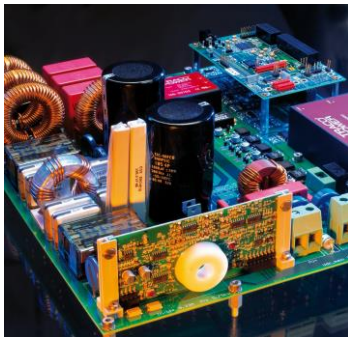
Electrical  
Installation  
Works

Power  
Systems  
Studies

Industrial  
Automation

Energy  
Efficiency

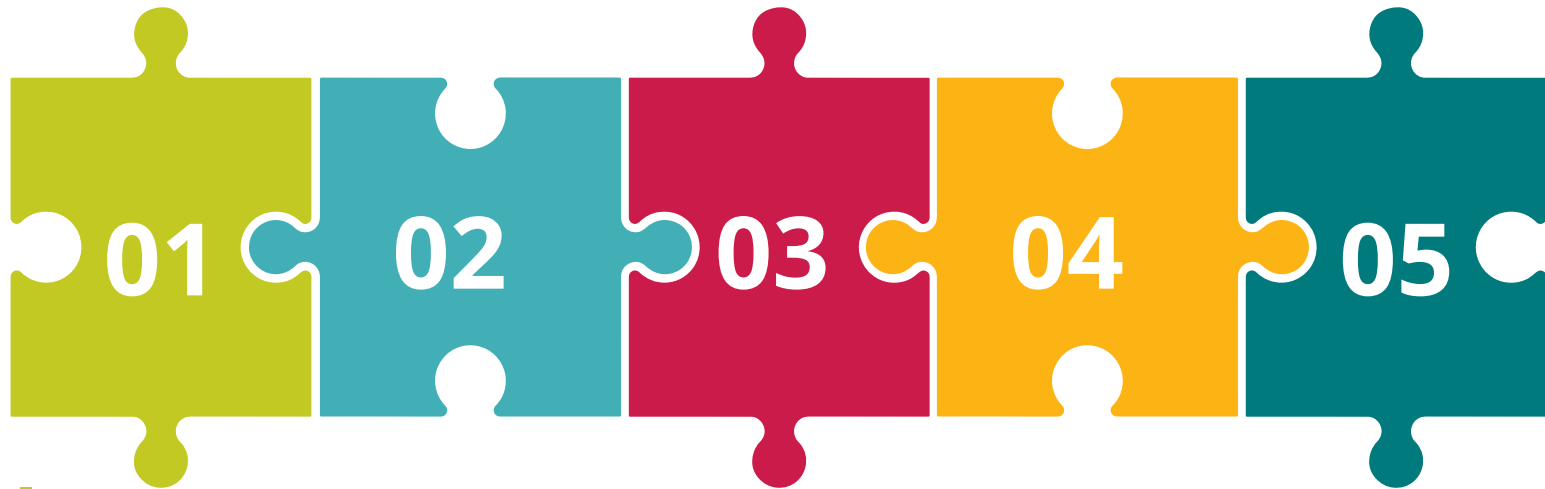
Transformers  
Design





# Some Applications Related To **EEE** Program Curriculum

8



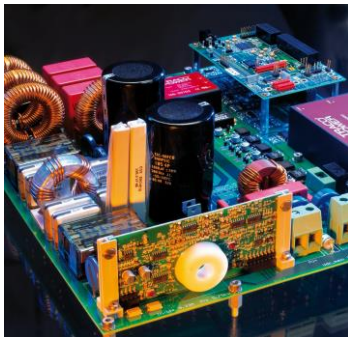
Power  
Electronics

Solar PV  
Energy

Wind  
Energy

Electric  
Vehicles

MAGLEV  
Monorails



# Samples of **EEE** Graduation Projects

1

**E-Bike**

2

**Wireless Power  
Transmitter**

3

**Hybrid Microgrid for  
Telecommunication  
station**

4

**Smart Green Hospital**



6

**Electrical  
Installation for a  
Hospital**

6

**Energy Analysis and  
Management**

7

**Delta Robot**

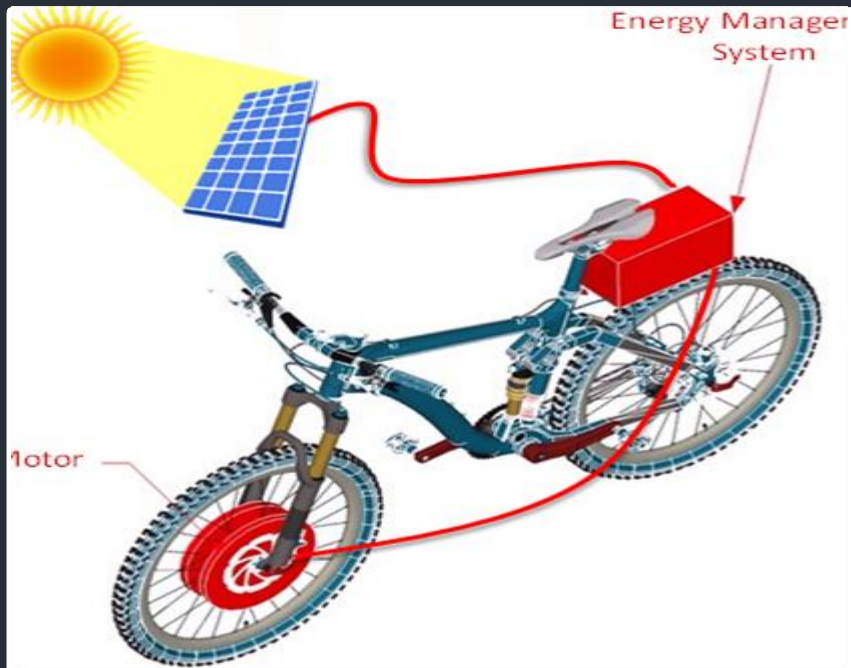
8

**Solar parabolic  
trough using PLC &  
SCADA**

4

**PLC based control  
system for grain  
storage silos**

# Design and Implementation of a cost effective E-Bike



## Objective:

Introducing to the Egyptian market a public transportation method with a low initial investment cost, locally implemented, also user & eco friendly.

## Description:

Designing & implementing a *motor drive* and an *energy management system* to upgrade a regular bike to an e-bike; so it would have 3 modes of operations:

- *Pedals only*
- *Electric motor*
- *Pedal assist*

With 2 different charging sources:

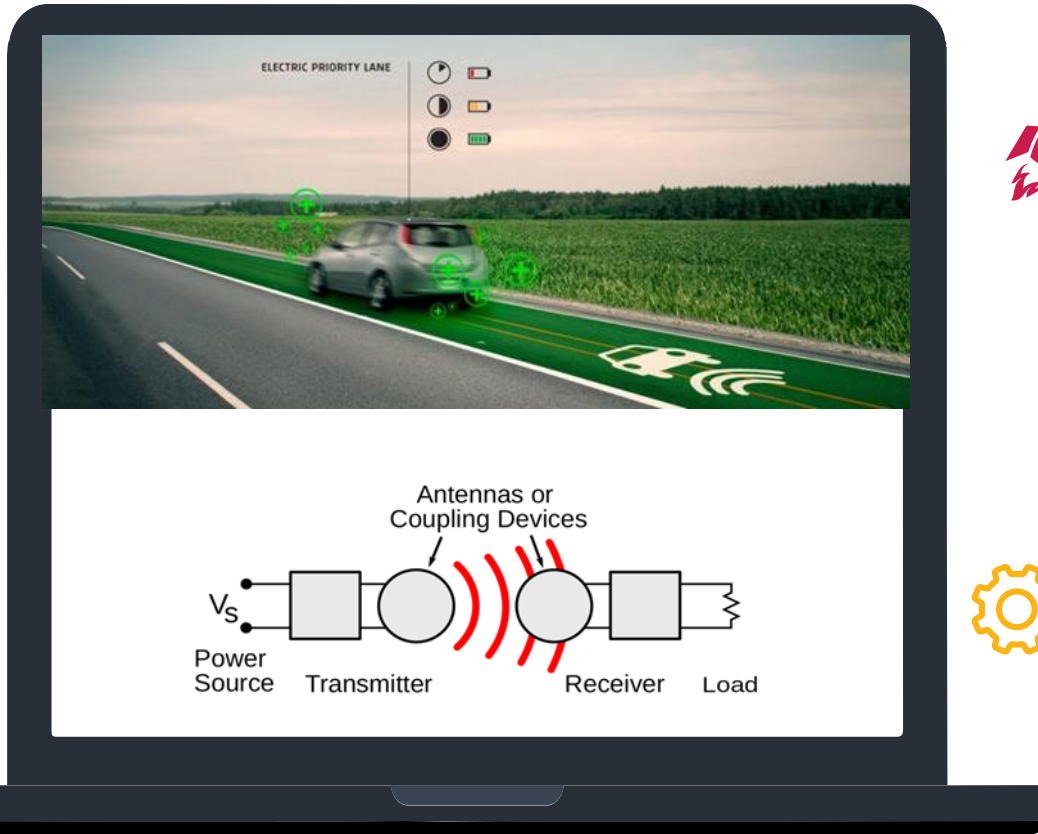
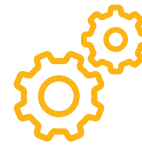
- *Wall socket*
- *PV panel*

# Wireless Power Transmitter

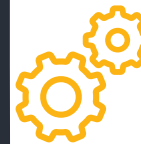
Electric Vehicles (EV) industry is invading the automobile field competing the Internal Combustion (IC) industry since it introduces a zero-emission vehicles which are friendly to the environment



Wireless power transfer (WPT), wireless power transmission or electromagnetic power transfer is the transmission of electrical energy without wires. The concept of WPT can resolve several issues regarding EV but the most significant one is that you can drive and charge your car simultaneously.



# Hybrid Microgrid operation and control for telecommunication sites sponsored by **Vodafone Egypt**

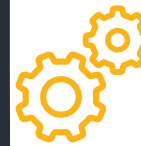


- **Project description:** Study and implement **hybrid power supply configurations** for **telecommunication sites** to maximize the penetration of **renewable energy** while satisfying the operational constraints like:
  - DC and AC Voltage stability
  - Frequency stability
  - Power quality
  - System autonomy
  - Energy storage lifetime
- **Project objective:** Design the system including
  - Hybrid energy storage system and its control
  - Power converters control
  - Power management system
  - Energy management system
  - Graphical user interface
  - Economic analysis

# Smart Green Hospital

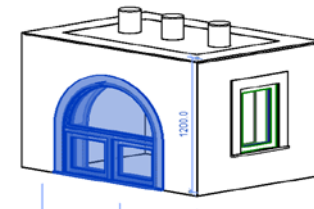
## Sponsored by **Schneider Electric**

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| 1) Load estimation.                | 10) Bus bar routing and sizing.     |
| 2) Lighting.                       | 11) Cable routing.                  |
| 3) Sockets.                        | 12) Cable trays sizing and routing. |
| 4) Circuit breakers.               | 13) UPS sizing.                     |
| 5) Cables sizing.                  | 14) Power factor correction.        |
| 6) Distribution boards.            | 15) Earthing.                       |
| 7) Lifts and fire pumps.           | 16) Voltage drop calculations.      |
| 8) HVAC.                           | 17) Short circuit calculations.     |
| 9) Feeding system and room sizing. | 18) Ecodial and protection.         |
|                                    | 19) Light current.                  |



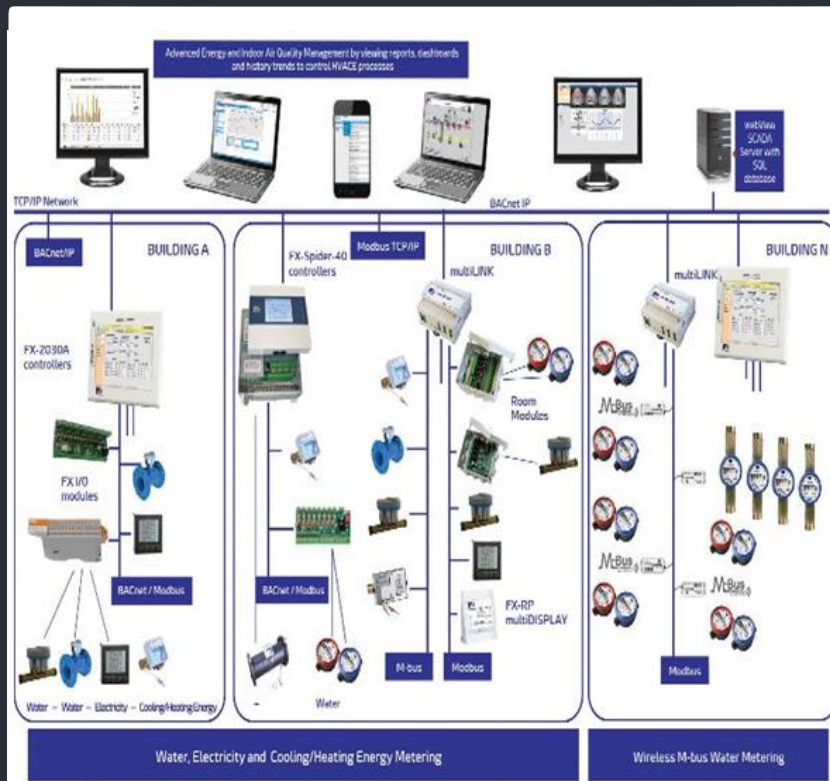
- KNX devices are building automation devices sponsored by Schneider electric.
- 3D room model (Mackket) will be done to demonstrate the various devices functionalities and automation scenarios.

3D view:





# Energy Analysis and Management



## • Summary:

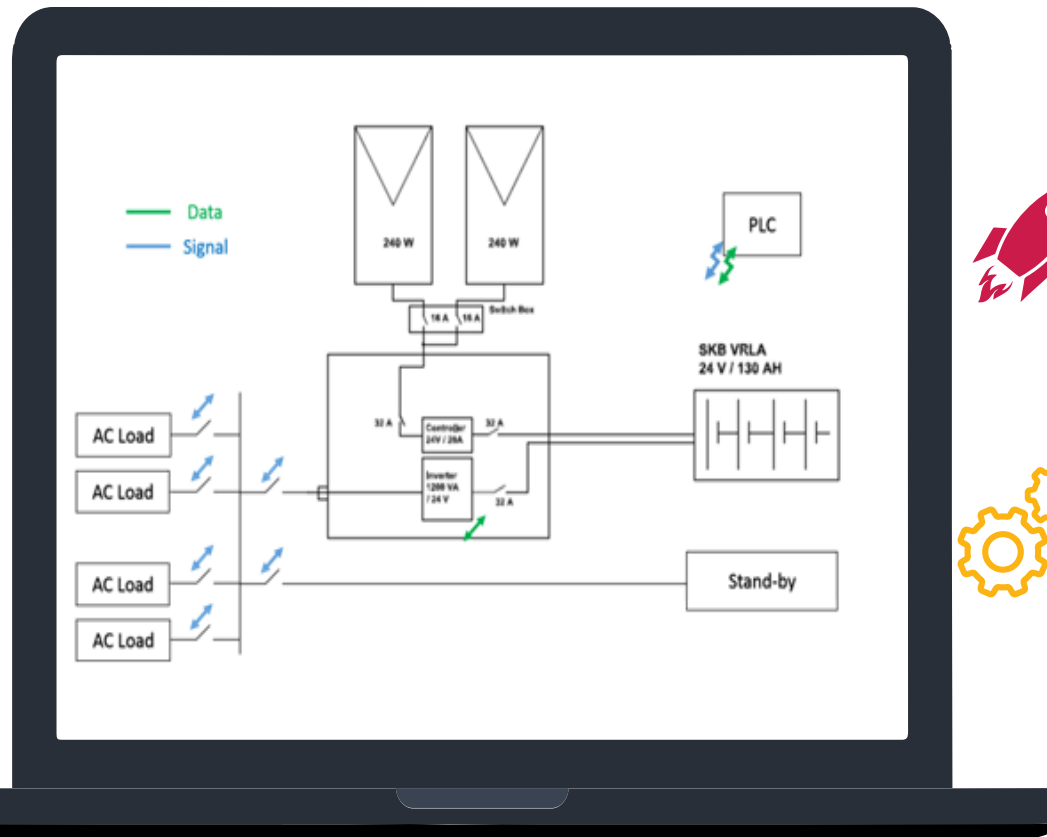
Automation systems and industrial plants are growing increasingly complex, with more flexible production in larger plants. So more insights into plant performance is needed with less and less people to do the job. Data storage and transactions needs to be reliable, cyber secure, and with high capacity.

## • Objective:

The aim of our project is to fully design and implement energy data acquisition system to monitor different types of energies such as electricity, heat and compressed air pressure from different sites to a centralized server. Followed by reports and technical analysis to the findings to make plan for continuous improvements in the following areas, Energy Saving, Co2 Emission monitoring and Improving energy efficiency.



# Smart Microgrid



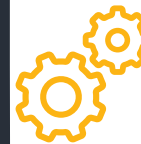
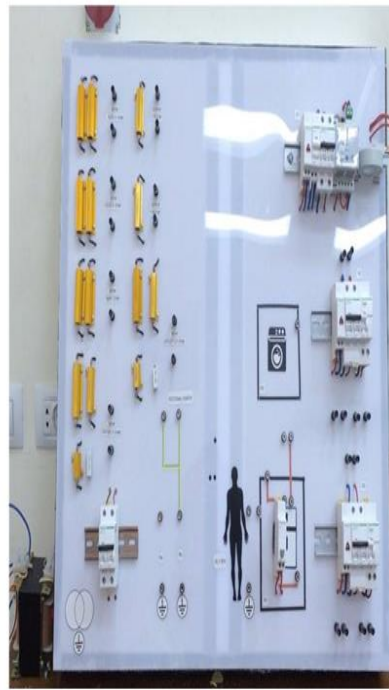
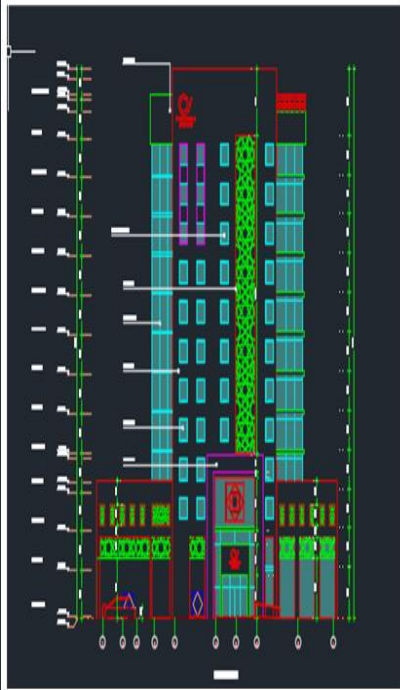
## • Project description:

- The aim of this project is to construct an isolated system, formed by distributed energy resources (DER), energy storage system (ESS), and loads that are electrically interconnected and hierarchically controlled.

## • Objectives:

- Connect PV inverter to the system as a distributed energy resource (DER).
- Programming PLC to implement Demand Side Management.
- Use of Smart Meter to measure: energy - power - current - voltage and transmit to PLC
- Develop the needed communication system to exchange the information between the different controllers

# Electrical Installation works for a Hotel with Earthing System Simulation kit



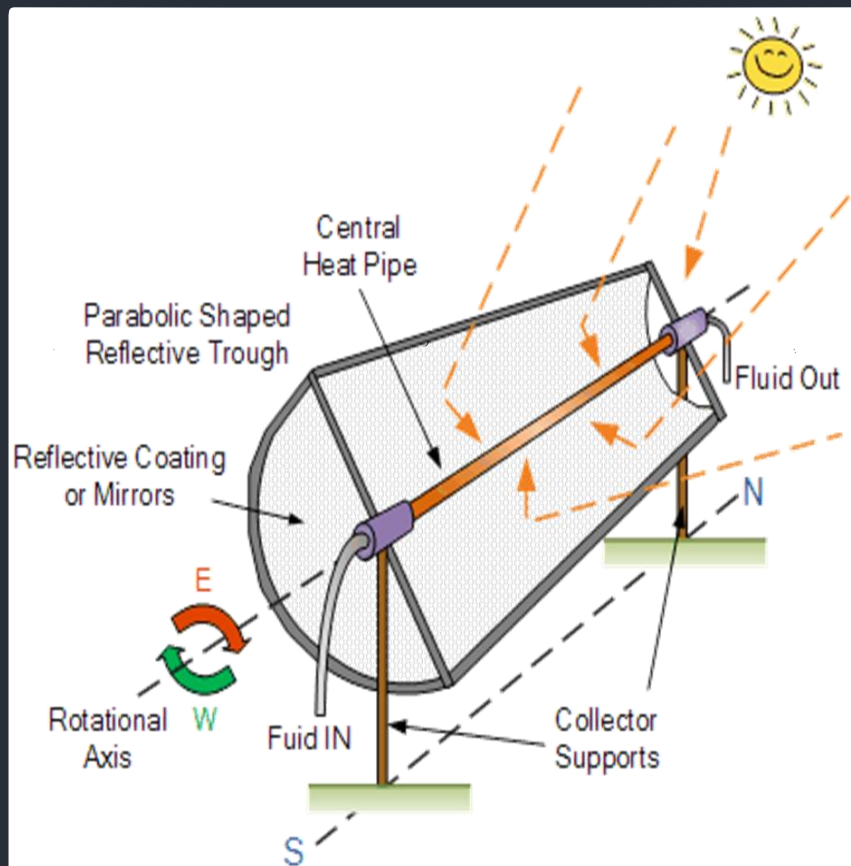
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|                                    | 19) Light current.                  |

# Delta Robot



**Design and  
implementation of  
a delta robot for  
picking and  
placing light  
objects**

# Control of Solar Parabolic Trough



**Design,  
Monitoring and  
control of solar  
parabolic trough  
using PLC &  
SCADA**

# Control of Grain Storage Silos



**Design of a PLC-  
Based control  
system for grain  
storage silos**

# Contact Info



## EEE Program Coordinators

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# Thank You

Electrical Energy Engineering Program - EEE