Faculty of Engineering
Cairo University

Credit Hours System

Electrical Energy Engineering Program

EEE

June 2018

Electrical Engineers: What they do ?

Electrical engineers specify, design and supervise the construction or manufacture of systems and equipment that produce, distribute and/or use electricity. They also maintain, operate and manage these systems and equipment.

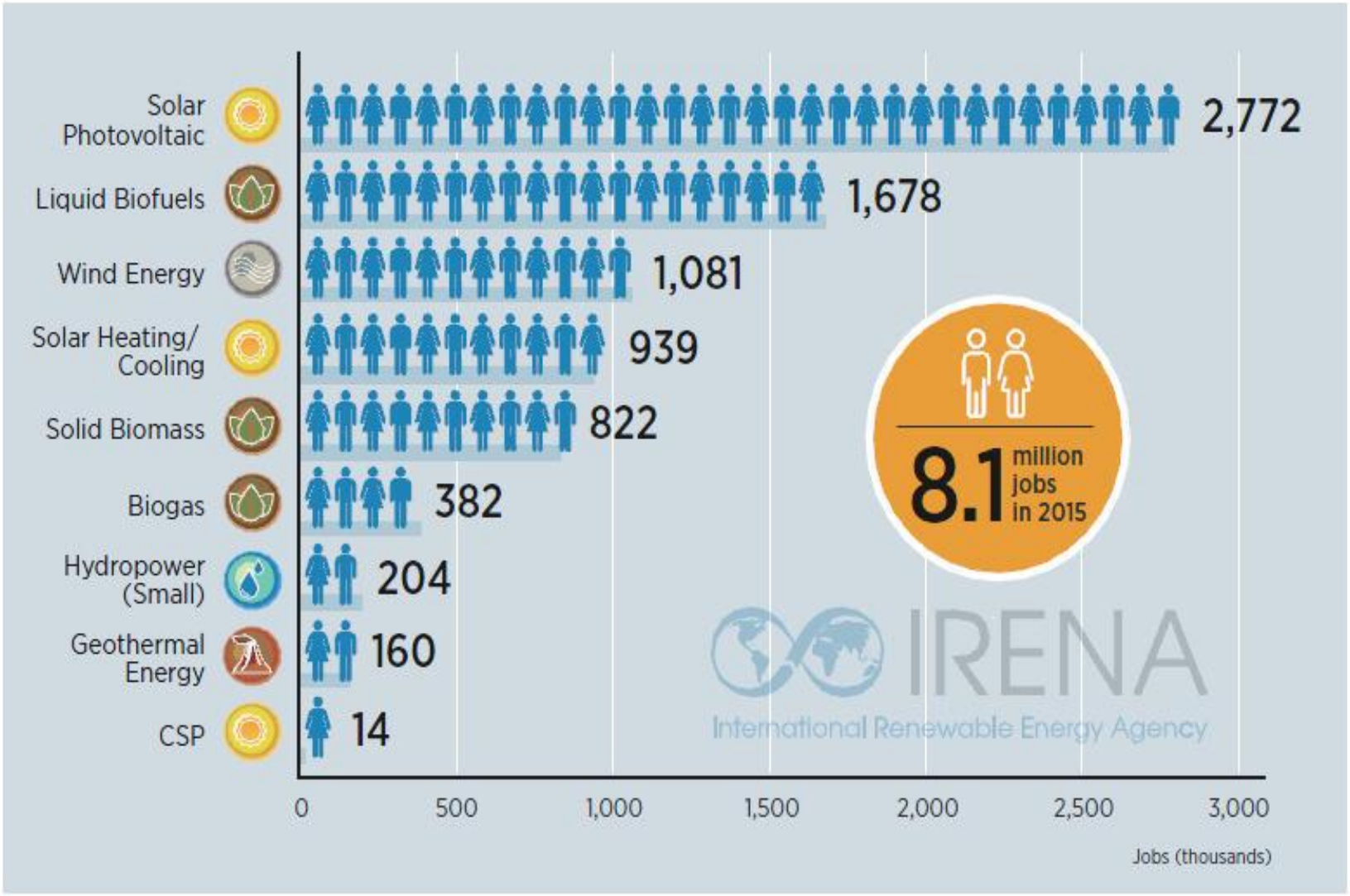
Electrical Engineers: What they do ?

- develop, design or update specifications and designs for electrical systems and equipment
- design methods to generate, distribute and manage electricity
- design automated and computerised methods to control industrial processes
- calculate the cost of projects, and materials needed
- supervise the installation and maintenance of systems and equipment

Electrical Energy Engineering: A Growing Field for Opportunities

- **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.**

FIGURE 1: RENEWABLE ENERGY EMPLOYMENT BY TECHNOLOGY



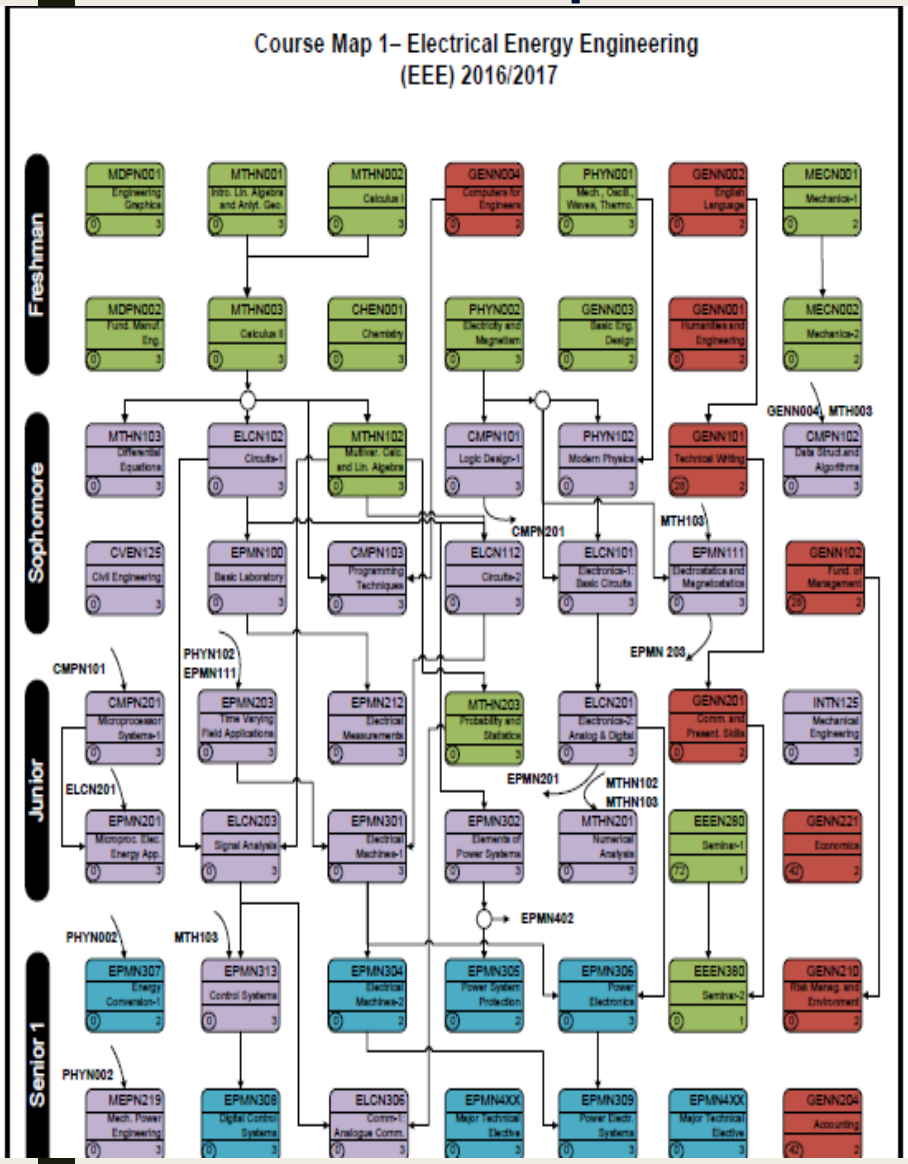
Educational Objectives

- **Offers fundamental knowledge.**
- **Enables work in regional and international markets.**
- **Develop communication, teamwork, and professional skills.**
- **Promote practical experience.**
- **Expose students to some important areas and integrate courses from many different disciplines, for students to develop the expertise needed to reshape how the world uses energy**

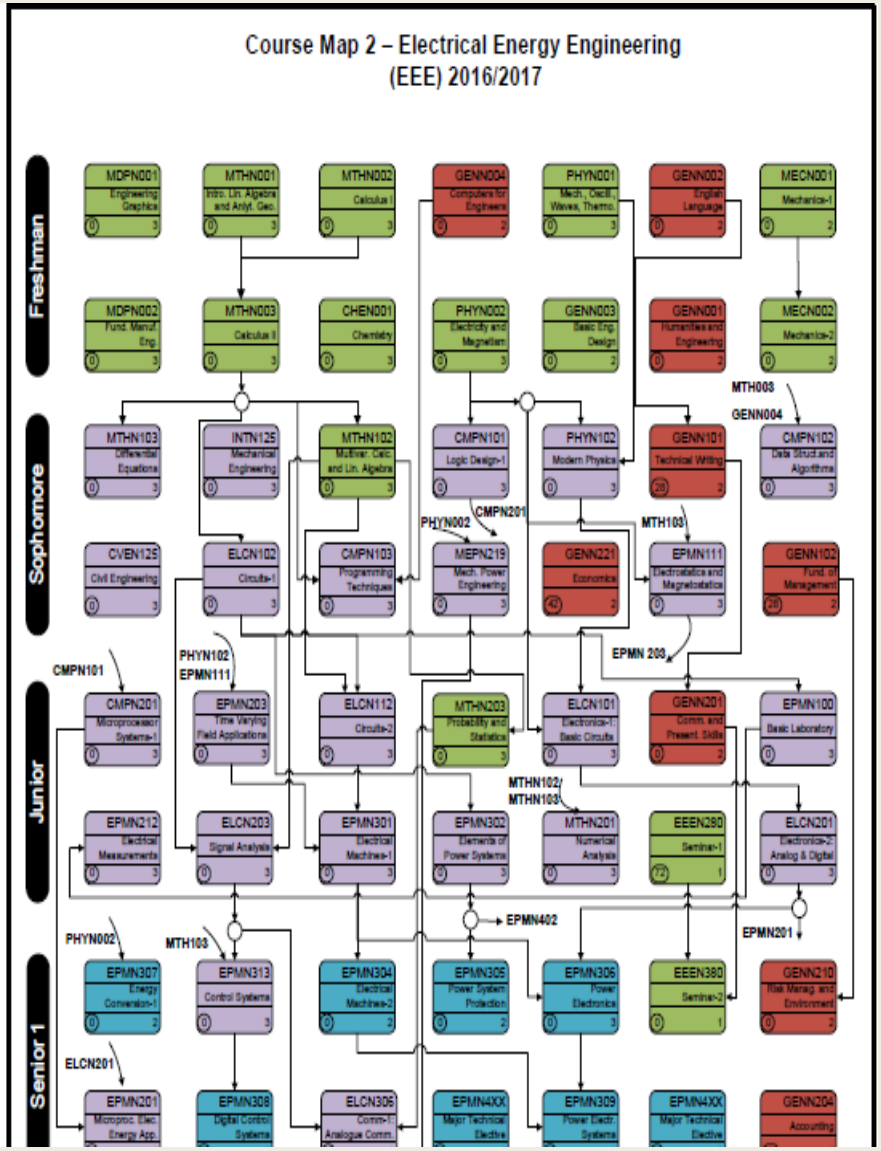
Philosophy of Curriculum

1. **Structured during the first four semesters.**
2. **Flexible during the upper six semesters.**
3. **Elective courses during the senior years.**
4. **Laboratory-based curriculum combines hands-on practice with the appropriate basic electrical and electronics theories.**
5. **Tailored to international standards**
6. **Serves direct market needs**
7. **Meets criteria of international accreditation.**

Course Maps

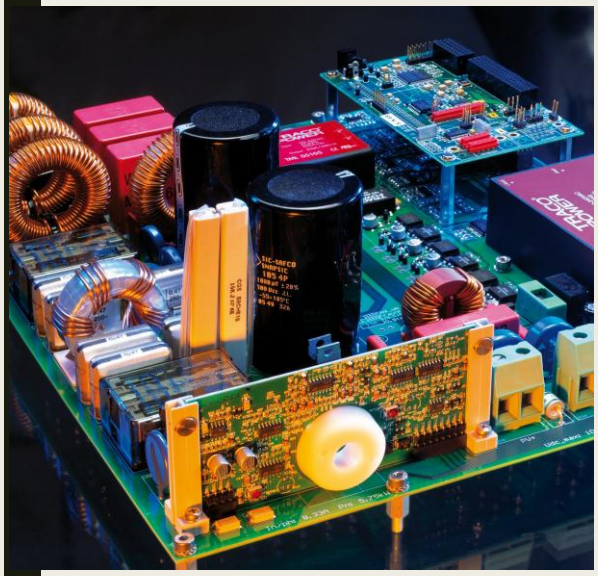


Course Map 1



Course Map 2

SOME APPLICATIONS RELATED TO EEE PROGRAM CURRICULUM

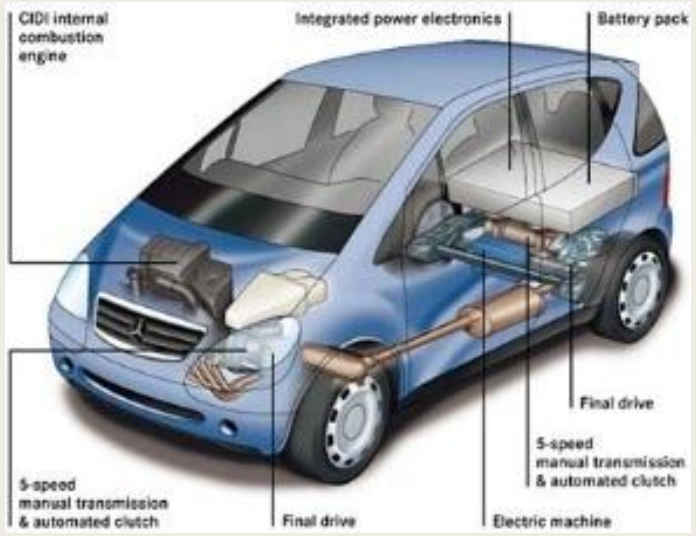


Power electronics

MAGLEV Monorails

Wind Power

PV Power



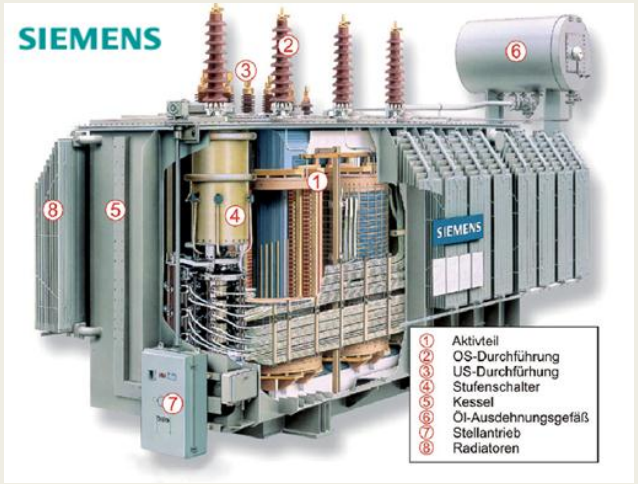
Electric Vehicles

SOME APPLICATIONS RELATED TO EEE PROGRAM CURRICULUM

Power systems

Industrial Automation

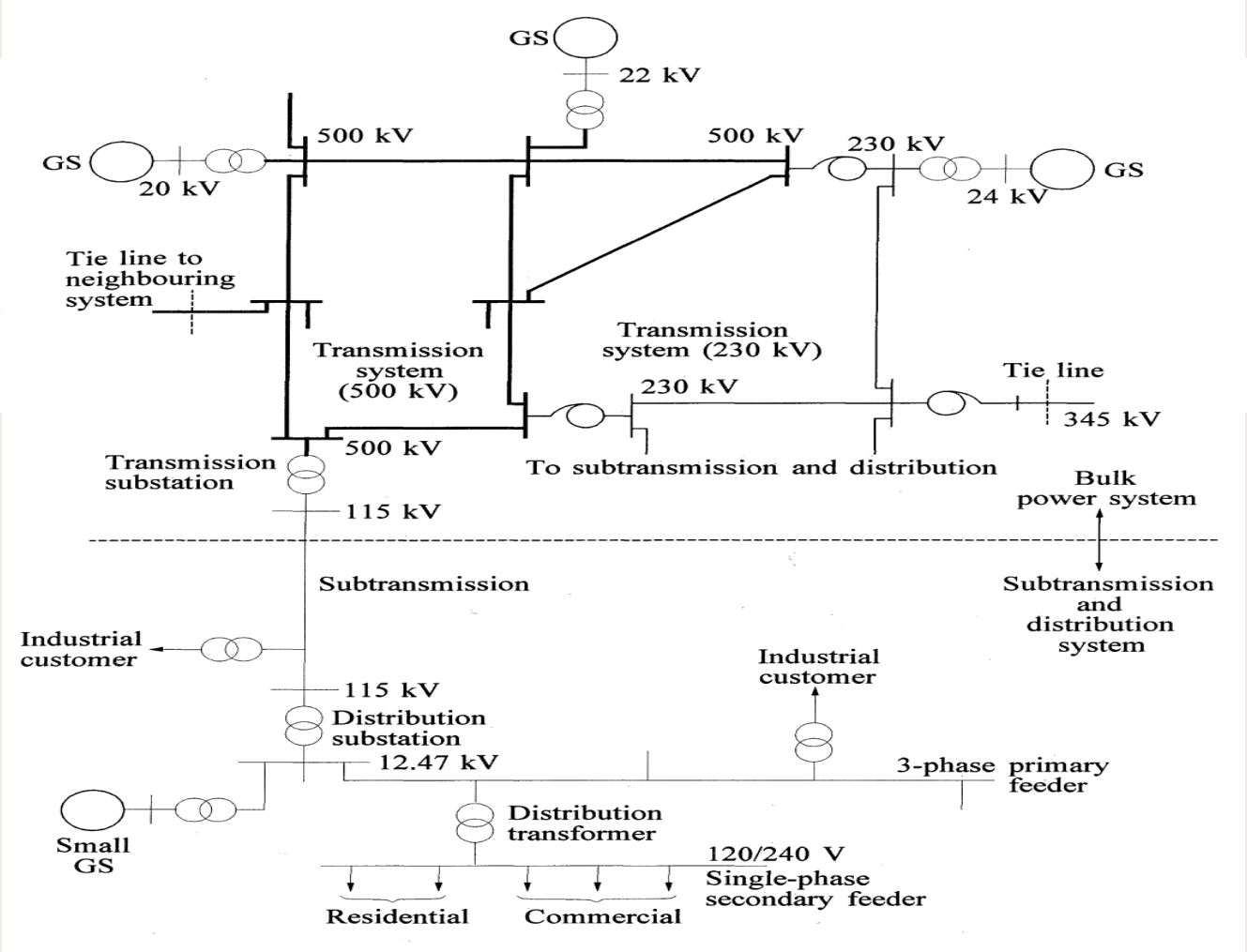
Energy Efficiency



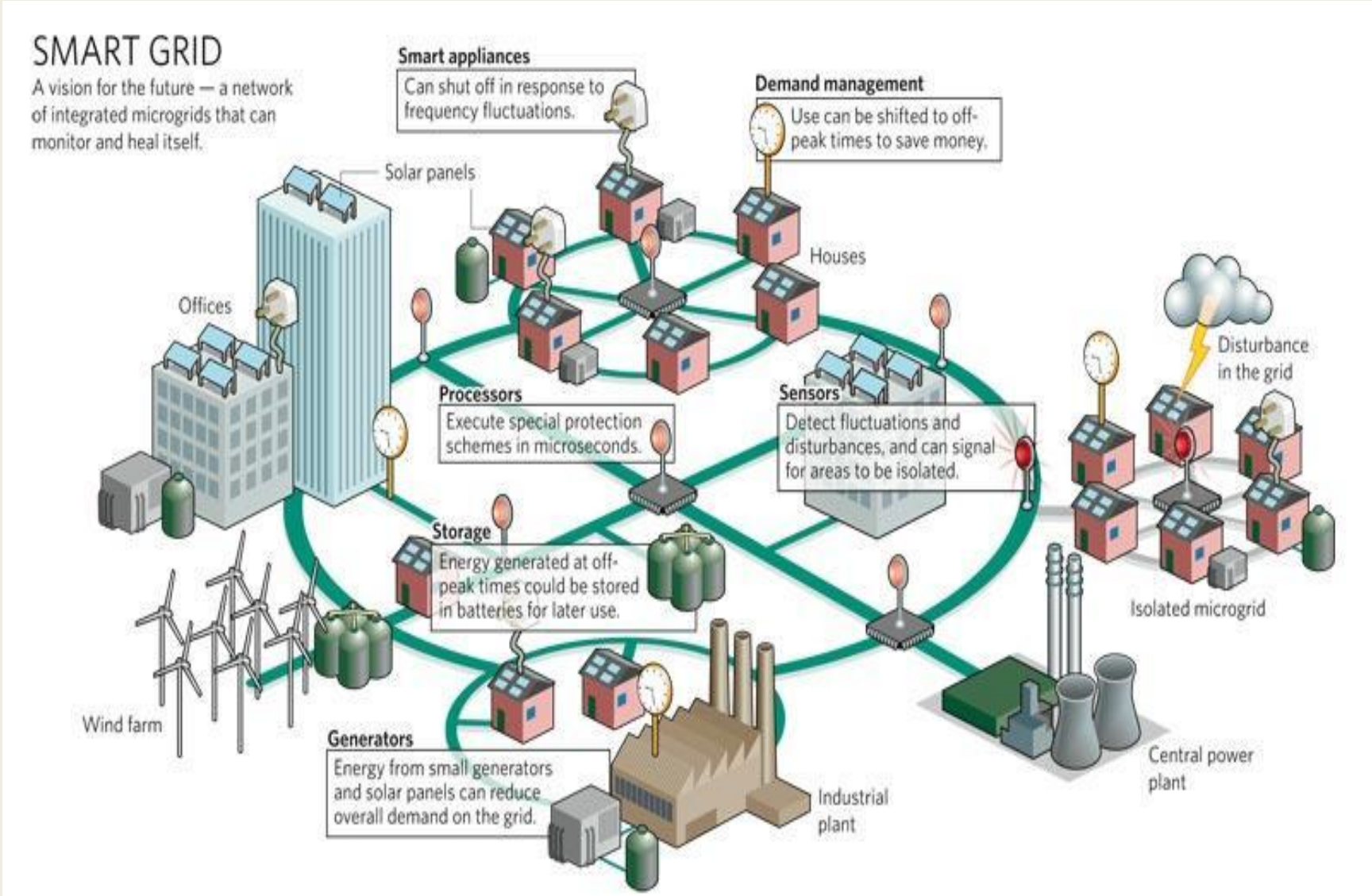
Transformer Design

Renewable Energy and Micro-grid applications

Classical Power System



Renewable Energy and Micro-grid applications



Job markets

One of the specialties which can get the first job easily.

Job categories are :

1- Design engineer

2- Site engineer

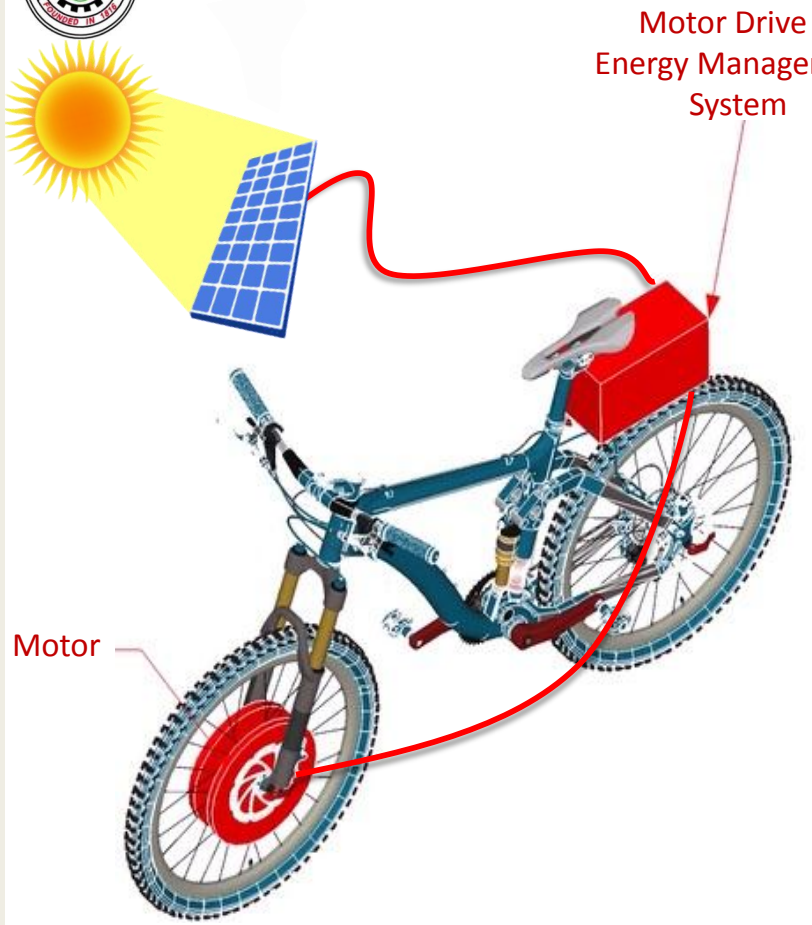
3- Operation engineer

4- Maintenance and troubleshooting engineer

Samples of EEE Graduation Projects

Design And Implementation Of A Cost Efficient E-bike

Cairo University



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:

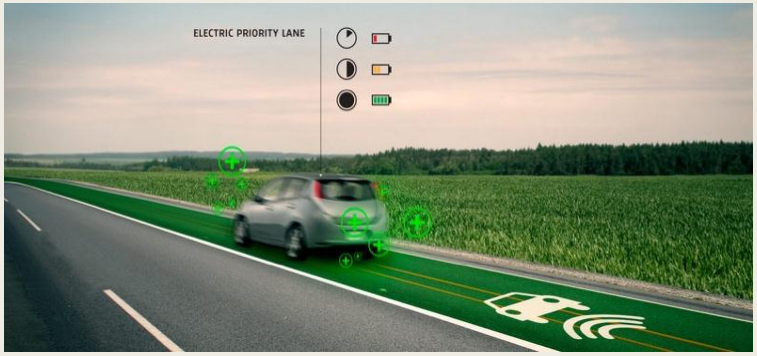
- *Pedals only*
- *Electric motor*
- *Pedal assist*

With 2 different charging sources:

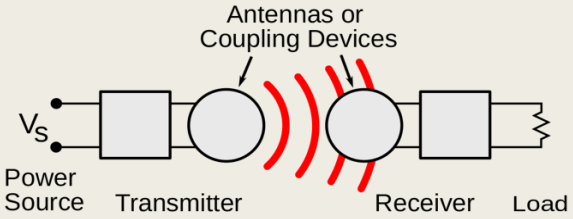
- *Wall socket*
- *PV panel*

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 Micro-grid operation and control for telecommunication

Project Sponsored by **Vodafone**

Cairo University

- **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

Cairo University

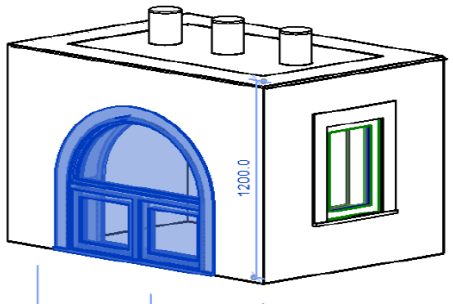
Distribution

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

- 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:



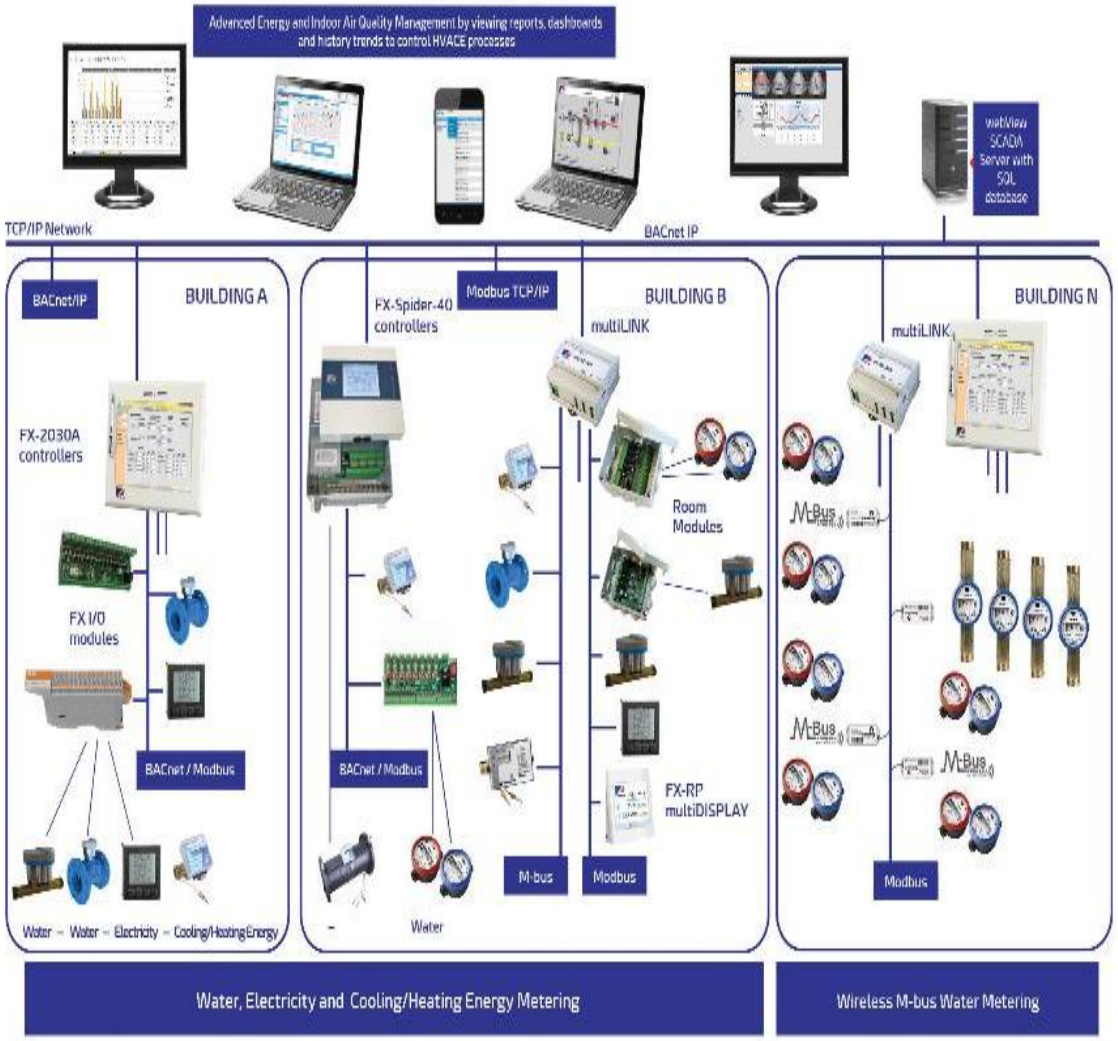
Energy Analysis and Management

- **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:**

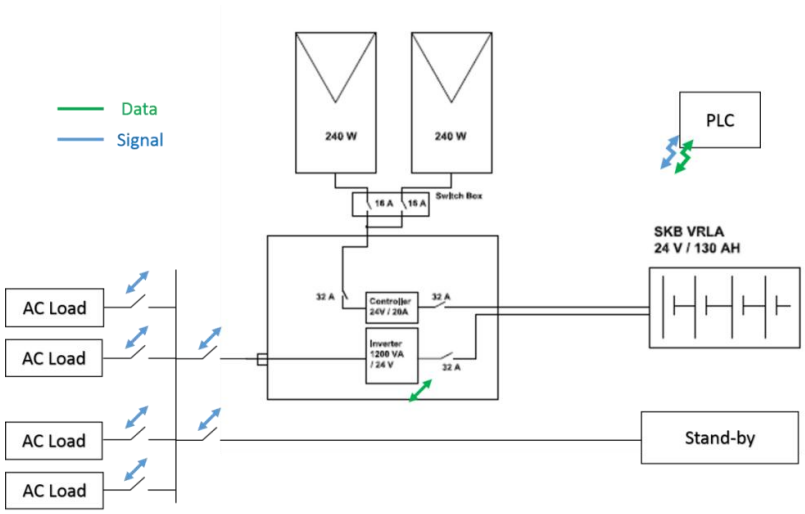
The aim of our project is to fully design and implement energy data acquisition system to monitor different types of energies such as electricity, heat and compressed air pressure from different sites to a centralized server. Followed by reports and technical analysis to the findings to make plan for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



Smart Grid

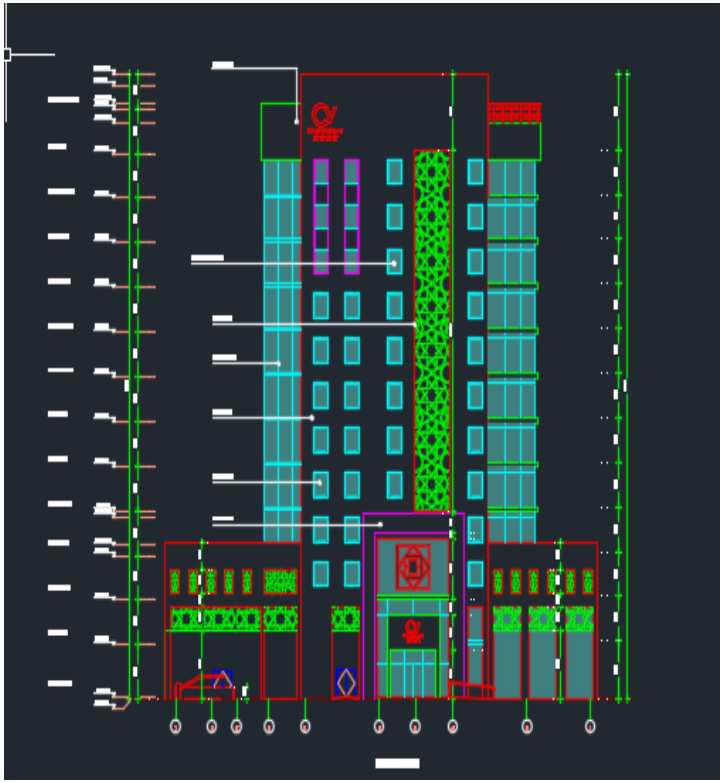
Cairo University

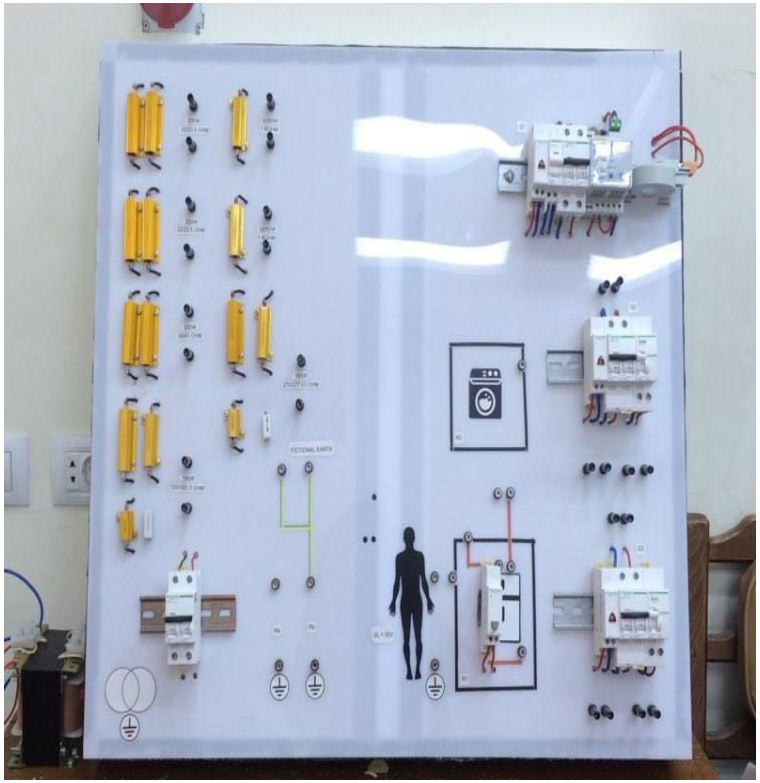
- Project description:
- **The aim of this project is to construct an isolated system, formed by distributed energy resources (DER), energy storage system (ESS), and loads that are electrically interconnected and hierarchically controlled.**
- Objectives:
- **Connect PV inverter to the system as a distributed 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 For Hotel

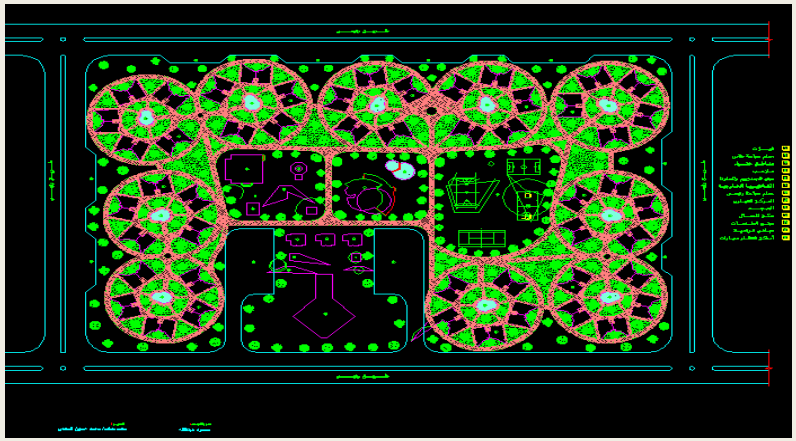
The project includes design for the electrical requirements to the building as the lighting system, sockets, HVAC system, light current system, cable sizing, short circuit calculations ,Single Line Diagram, and Earthing system simulation kit





Electrification of a Housing Complex Residential Area

The planning, design and operation of any distribution system require several studies to assign the infrastructure of the power system and to evaluate the operation indices that have to accommodate with technical and economic constraints. Successful system design has to choose and allocate appropriate system components at the least overall cost while satisfying customer satisfaction and standard regulations. The first and more important step in system design is to estimate present and projected loads that can be expected for such a system. Choosing distribution transformers, medium voltage and low voltage cable feeders, final distribution circuits, switchgear and protection devices have to be correctly assigned. This requires more analysis and calculations of the load flow and short circuit for the distribution system. Besides, equipment technical data and devices characteristics have to be deeply understood.



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