Electrical Power Engineering Laboratory

(Location: Electrical Engineering Department, ground floor)

1- Lab Photos

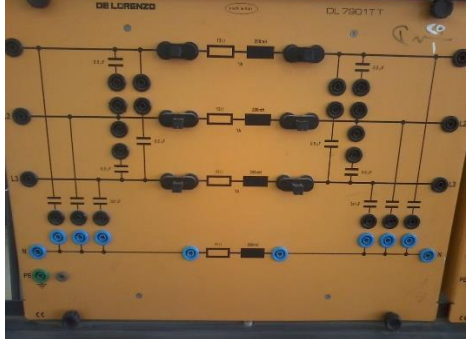

Photo 1

Photo 2
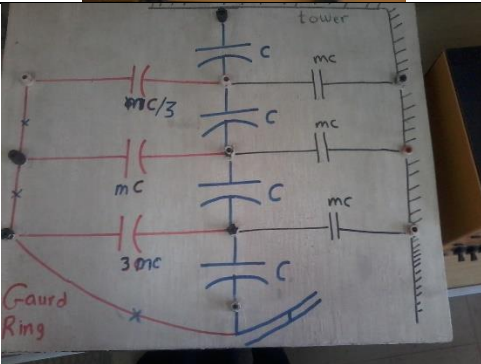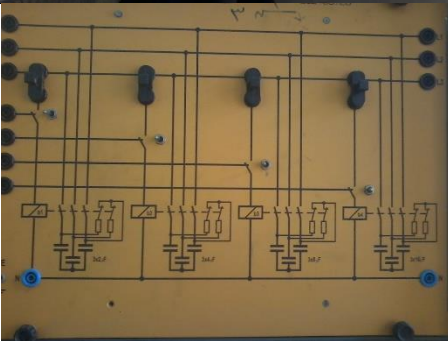
2- Lab Description

The electrical power lab is used to teach the practical part of the courses of Electrical Power Engineering (1), Electrical Testing (1), and Electrical Testing (2) for students of the second, third and fourth levels of the Electrical Power Engineering and Machines Program. It is also used in teaching the laboratory part of Electrical Power Engineering courses for students of the other programs.

3- Lab Equipment

The following is a table of equipment and devices that are used in the experiments.

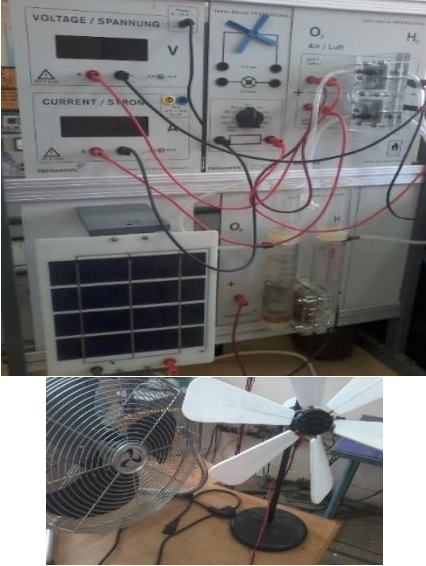|	Component	Description	Picture
1	Transmission line model	• Model of overhead TL 360Km, 380 KV, 1000 A. • Scale 1:1000 • π model • natural load 600 MW.	
2	3-phase variable resistive load	• Each phase has 7 positions (46 W: 400 W) • Connection: star, delta, or parallel	
3	3-phase variable inductive load	• Each phase has 7 positions (34 VAR: 297 VAR) • Connection: star, delta, or parallel	
4	3-phase variable capacitive load	• Each phase has 7 positions (30 VAR: 275 VAR) • Connection: star, delta, or parallel	
5	Digital Multi meter	• Digital Multi meter	

6	Power factor meter	• Measure power factor and the phase angle of one phase • 3:1000 V, 0.1:30 A	
7	Model of string of Suspension insulator	• Study the effect of Gard ring in equaling the voltage in the units of the insulator	
8	4 Capacitor bank	• Used for control (manual or automatic) power factor • 3×2 **µF**, 3×4 **µF**, 3×8 **µF** and 3×16 **µF**,	
9	3-phase auto transformer	• Produce controlled ac voltage	

1 0	Hybrid PV, wind turbine and fuel cell system	• The output of PV or WT is used to feed electroser cell to produce H2 and O2 to feed the fuel cell to produce power "energy storage system"	
1 1	PV system	• Small PV panel feed variable resistance	
1 2	DC network analyzer	• For analysis of ac power systems as fast calculation short circuit current at complex network.	
1 3	Digital measurement unit	• Measure volt, current, active power, reactive power, PF,…… • For 3-phase	

1 4	FOG	• Determine the location of fault for cables	
1 5	Tower Insulations	• Practical Tower Insulations	

4- Lab Experiments

First year:
Course: None   **Code: None**

Second year:
Course: Electrical Power Engineering (1)   **Code: ELE211**
1- **Exp 1: Digital and experimental simulation of DC distributer,**
2- **Exp 2: The characteristic of a line: 1-short circuit test,**
3- **Exp 3: The characteristic of a line: 2- No-load test,**
4- **Exp 4: Double busbar basic system: 1- Operating a switching station with two busbars and different voltages at no-load,**
5- **Exp 5: Double busbar basic system: 1- Operating a switching station with two busbars and different voltages with load,**
6- **Exp 6: Performance of medium transmission line represented by T-method,**
7- **Exp 7: Performance of medium transmission line represented by π-method.**

Third year:
Course: Electrical Testing (1)   **Code: ELE305**
1- **Exp-1: Modeling of DC power network on DC network analyzer,**
2- **Exp-2: Double busbar basic system. 1- Operating a switching station with two busbars with different voltages. 2- Double busbar system with load. 3- Busbar coupling,**
3- **Exp-3: Reactive power compensation. Demonstrating the manual operation on the control of reactive power at various inductive loads,**
4- **Exp-4: Reactive power controller at various inductive loads and at different sensitivity,**
5- **Exp-5: Potential distribution over a string of suspension insulators and improving it using a guard ring,**
6- **Exp-6: Solar photovoltaic power generator,**
7- **Exp-7: Network solution node elimination by matrix partitioning and solve the network using the reduced matrix,**
8- **Exp-8: Revision.**

Fourth year:
Course: Electrical Testing (2)   **Code: ELE415**
1- **Exp-1: Short circuit currents determination in AC power network using DC network analyzer,**
2- **Exp-2: Service tests of cables. 1- Performing the standard cable tests, which are required for checkup during the service time,**
3- **Exp-3: Measurement of earthing resistance. 1- Measurement of earthing resistance using the fall of potential method. 2- Determination of the step and touch voltage,**
4- **Exp-4: Measurement of earthing resistivity using four-electrode method.**

5- Lab Maintenance

The laboratory is evaluated to determine the experiments and their readiness to participate in the teaching process and to determine the required maintenance periodically, and the capabilities and problems of the laboratory are periodically reported after each experiment.