# **Electrical Engineering Department Labs**

## **1.** Power Electronics and Drives Laboratory

The Power Electronics and Drives Laboratory is located in Building #11 (Room no:2154).

#### **\*** Laboratory Purpose:

The hardware laboratory can support several experiments on Thyristor Commutation Techniques, Controlled Rectifiers, AC Voltage Controllers, Closed-loop control of DC drives, DC Choppers, etc. In addition, PSIM software is available in this laboratory to explore the theory, development and analysis of Power Electronics systems, and their applications in various domains.

#### **Courses using the Lab:** EE336 - Electric Energy & Power Systems Lab.

Device name
1. Table
2. Panel frame
3. Single phase transformer
4. 3-phase transformer
5. Resistive load
6. Capacitive load
7. Inductive load
8. Shunt wound dc machine
9. Universal motor
10. Induction asynchronous 3-phase machine
11. Series wound dc machine
12. Compound wound dc machine
13. Synchronous AC machine
14. Slip ring machine
15. Capacitor motor machine
16. Motor/generator test system
17. Isolation amplifier

Device name
18. Motor protection switch
19. Star/delta switch
20. Tacho generator
21. Motor regulated resistor
22. Field regulator resistor
23. Coupling and coupling guard
24. 3-phase AC power supply
25. DC power supply
26. Variable AC/DC Power supply
27. Digital multimeter
28. Power meter
29. Power factor meter
30. Connecting leads
31. Trolley table
32. Storage cabinets
33. Panel frame
34. Generation and synchronization
35. Synchronous machine
36. Excitation voltage controller
37. Synchronization unit
38. Synchronization indicator
39. Synchro scope
40. Power circuit breaker
41. Double voltmeter
42. Double frequency meter
43. Active power controller
44. Generator reactive power controller
45. Control voltage controller
46. Pendulum machine

Device name	
47. Control unit for pendulum machine	
48. Coupling guard 1	
49. Shaft end guard	
50. Taco generator	
51. Resistive load	
52. Inductive load	
53. Capacitive load	
54. Transmission line study	
55. Transmission line model	
56. Three phase transformer	
57. Transmission line capacitor	
58. Single phase current transformer	
59. Load for single phase current transformer	
60. Single phase voltage transformer	
61. Power analyzer	
62. Digital multimeter	
63. Tachometer infra contact	
64. Energy consumption study	
65. Magnetic powder brake	
66. Battery control unit	
67. Coupling	
68. Safety leads 25cm	
69. Safety leads 50 cm	
70. Safety leads 100 cm	
71. Safety connecting leads	
72. Safety bridging plugs black	
73. Safety bridging plugs green/yellow	
74. Bridging plugs with tap	



# 2. Electric Energy and Power Systems Laboratory:

The Electric Energy & Power Systems Lab is located in Building #11 (Room no: 2143).

#### **\*** Laboratory Purpose:

This laboratory provides the students different experiments on DC and AC machines on both no load and loaded conditions. The data obtained from these experiments are used to find main performance parameters of the machines.

In addition, this lab provides the student's three-phase circuit's connections, single phase, and three phase transformer efficiency and regulation calculation tests.

Courses using the Lab: EE336-Electric Energy & Power systems Lab, EE480 – Electric Machines.

Device name
1. Working table
2. Panel frame
3. Dc power supply
4. Reference variable generator
5. Diode
6. Thyristor
Device name

7. Triac panel
8. Mosfet panel
9. GTO thyristor panel
10. Three fold fuse
11. Transformer
12. Load
12 Control unit two pulse single phase
15. Control unit two pulse single phase
14. Control unit six pulse three phase
15. Trigger point limiter
16. PFM,PWM control unit PFM PWM
17. Capacitor panel
18. Rectifier
19. Function generator
20. Isolation amplifier
21. Run-up control unit
22. Thyristor speed control unit
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23. Shunt wound dc machine
24. Tacho generator
25. Coupling
26. Coupling guard
27. Ac convertor
28. Squirrel gauge motor
29. Multi-measuring instrument
30. Digital multimeter
31. Analog oscilloscope
32. Leads
33. BNC/4mm , BNC/BNC leads
34. Bridges
35. Storage cabinets



# 3. Microprocessor Lab

The Microprocessor lab is located in Building #11 (2139).

### Laboratory Purpose:

This laboratory focuses on the programming side of hardware, it has training kits that are used for programming microprocessors and microcontrollers through a PC that is connected to these kits.

Student work with the MDA8086 kit to program the microprocessors and the Y0037 kit to program PIC microcontrollers.

The microprocessor experiments focus on the assembly language (Low Level) and controlling the microprocessor features, students will also learn how to optimize the code to get a program working with fewer lines of code, they learn also how to control different electronic components (LED, 7 segment display, Digital to Analog Converter).

The mechatronics experiment focus on the PIC programming in assembly and C language using MPLAB and PIC compiler: student learn how to control different electronic components (LED, 7 segment display, Stepper motor, read analog voltage coming from sensors and display it as a digital value).

Courses using the Lab: EE 234-Microprocessors Lab & EE-429 Mechatronics.

Devic	ce name
1-	MDA training kit
2-	Mechatronics Training Set



# 4. Mechatronics and control lab

The Mechatronics and Control Laboratory is located in Building #11 and room# 2145.

### **\*** Laboratory Purpose:

The Mechatronics and control lab let students practice the analogue systems control through experimentation: By using RYC units, they can study the behavior of 1<sup>st</sup> and 2<sup>nd</sup> order system and learn how to change its parameters. Student will also practice the implementation of PID controllers and adjust its settings to find the system's best compromise between stability, speed and steady state error.

In addition to the available equipment, students can simulate their system using MATLAB Simulink to find the optimal results before implementing them on real equipment.

Students will work also with Programmable Logic Controller PLC to learn how to create ladder programs to control industrial production chains.

Courses using the Lab: EE 431 Mechatronics and Controls Lab

Device name		
1.	RYC control unit	
2.	PLC unit	
3.	PLC base station	
4.	Sensors kit trainer	
5.	Programmable logic controller	



# 5- Digital Logic Laboratory

The Digital Logic Lab is located in Building #11 (room 2137).

### \* Laboratory Purpose:

This laboratory is equipped with several educational training kits along with their PCs in order to reinforce classroom lectures and provide hands-on-training in digital design techniques and procedures: students are exposed to a wide range of laboratory experiments that cover the physical and engineering properties of different digital logic design issues.

Such experiments mainly utilize the two digital hardware training sets of Y0100/Y0200 and the Multisim software simulator for digital logic design: students conduct experiments for digital design on Analyzing and Verifying the Behavior of Logic Gates, 7-Segment Display, K-Maps and Boolean Algebra, Combinational logic Design and Analysis, and Sequential Logic Design and Analysis.

**Courses using the Lab:** EE 232-Digital Logic Design Lab.

- Device name
- 1. Digital Logic Training Set (Y-0010 Experiment Set)
- 2. Digital Logic Training Set (Y-0020 Experiment Set)



# 6- Communication Systems Fundamentals Laboratory

The Communication Systems Fundamentals Lab is located in Building #11 (room 2141). **Laboratory Purpose:** 

The goal of this laboratory is to study communication systems through experimentation: Upon completion of this lab, students should be able to use standard laboratory equipment to analyze the behavior of basic communication systems and to design and construct simple communication experiments such as Amplitude Modulation and Demodulation, Frequency Modulation and Demodulation, Pulse Amplitude Modulation, pulse code modulation ...etc. In addition, the ability to use communication test & measurement instruments such as oscilloscopes, CASSY, etc.

#### **Courses using the Lab:** EE 333 Communication Systems Fundamentals Lab.

Device name
1. Educational laboratory Virtual Instrumentation Suite programmable using labview, connects to a PC using USB port, includes the following 12 integrated instruments
2. Plug-in communications board for the educational laboratory suite fully programmable with labview.
<ol> <li>Plug-in board for the educational laboratory suite for signal processing Design and Prototyping Platform for hands-on approach and teaching university-level signals and systems as well as introduction to signal processing courses.</li> </ol>
4. Magnetic powder brake
5. DC voltage source
6. AC Power supply
7. Function generator
8. Dc power supply
9. Function generator
10. AM transmitter
11. AM receiver
12. Fm/pm modulator
13. Fm/pm demodulator
14. ASK/FSK/PSK transmitter
15. ASK receiver
16. FSK/PSK receiver
17. PAM modulator
18. PAM demodulator
19. PCM transmitter
20. PCM demodulator
21. Oscilloscope

Device name
22. Digital multimeter
23. Data acquisition system
24. Fiber Optic transmitter
25. Fiber Optic receiver
26. Set of FSMA optical fibers
27. Optical waveguide
28. Optical power meter
29. Fiber Micro-positioner
30. Plug-in panel
31. Wireless transmitter
32. Wireless receiver
33. DSP kit
34. Spectrum analyzer
35. Network analyzer



# 7- Electrical Circuits and Electronics Laboratory:

The Electrical Circuits and Electronics Laboratory is located in Building #11 and room# 2135.

### Purpose:

The purpose of the electric circuits part of this laboratory is to practice essential laboratory measurement and report preparation skills, to reinforce the concepts and circuit analysis

techniques, and to gain an increased understanding of some of the practical issues of electrical engineering circuit analysis and design. It is equipped with various types of resistors, variable rheostats, inductor banks, capacitor banks, dc and ac power supplies, switches, lamp boards, ammeters, voltmeters, analog and digital wattmeters, function generators, oscilloscopes, etc.

In the laboratory classes, students are taught how to build electric circuits, safety rules of electric circuits, installation of common household appliances and how to write technical reports. The students also verify different electric circuit and network theorems e.g., KCL, KVL, mesh, node, Y-D and D-Y transformation, Thevenin's, Norton's, maximum power transfer and superposition theorems, etc. They also construct phasor diagram of the circuits from the experimental data, determine mutual inductance for the coupled circuits, find the series and parallel resonance frequency of ac circuits, types of filters and quality factors of the inductance coil, measure the ac power in the single phase and three phase circuits, etc.

As for the electronic circuits part of this laboratory, its main purpose is to study electronics through experimentation. Students will be able to use standard laboratory equipment to analyze the behavior of basic electronic devices and to design and construct simple circuits containing these devices, Such as Diode Characteristics, Half wave and full wave Rectification, BJT Transistors, MOSFET Transistors, etc. In addition, they will have the ability to use electronic test & measurement instruments and software, such as oscilloscopes, function generators, etc.

Beside the student experiment sets, the laboratory also has simulation programs such as (MULTISIM simulation) to help students measure exact results and error.

Courses using the Lab: EE 247 Electric Circuits Lab & EE 248 Electronic Circuits Lab.
 Equipment:

Device name
1. Digital Multimeter
2. Power meter
3. Digital Multimeter
4. magnetic powder brake
5. DC voltage source
6. AC Power supply
7. Function generator
8. Oscilloscope
9. Measurement Device with Middle Indicator
10. Multimeter
11. Variable Resistor
12. Variable Capacitor
13. Function generator
14. MOSFET panel

