Contents

1. Power Electronics and Drives Laboratory

The Power Electronics and Drives Laboratory is located in Building #11 (Room no:2154).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. Detailed information about the equipment present in this laboratory is given in Appendix C.

Courses using the Lab: EE482-Power Electronics

2. Electric Energy & Machines Laboratory

The Electric Energy & Power Systems Lab is located in Building #11 (Room no: 2152). 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 and are the same time to draw characteristic curves between measured parameters during no load-loaded tests. In addition, this lab provides the student's three-phase circuit's connections, single phase, and three phase transformer efficiency and regulation calculation tests. Detailed information about the equipment present in this laboratory is given in Appendix C.

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

3. Power Systems Laboratory

The Power Systems Lab is located in Building #11 (**Room no: 2416).**

The Power Systems teaching Laboratory provides students hands-on learning tools that teach the many properties of electric generation and use. The three workstations in the lab include test benches to teach power system components, transformers, protection, control. Beside the student experiment sets, the laboratory also has Power world simulation program provides students learn modeling and simulations of the different structure of power systems to understand the load flow, fault and stability analysis. Detailed information about the equipment present in this laboratory is given in Appendix C.

Courses using the Lab: EE481-Power Systems Lab

Appendix-C:

Machine Lab and Power Systems: مختبر الآلات والقوى الكهربائية

ت	اسم الجهاز	No of units
١	طاولة Table	٦
٢	أطار حامل للقطع panel frame	٣
٣	محول فاز واحد single phase transformer	٣
٤	محول ثلاثي الأطوار 3-phase transformer	٣
٥	حمل مقاومات مادي متغير ثلاثي الأطوارresistive load	٣
6	حمل سعوي متغير ثلاثي الأطوارcapacitive load	٣
7	حمل ملفات متغير ثلاثي الأطوالinductive load	٣
8	آلة تيار مستمر توازي ١ كيلو وات shunt wound dc machine	٣
9	آلة عامة للتيار المستمر والمترددuniversal motor	٣
10	آلة تيار ثلاثي الأوجه تحريضية غير متوافقةinduction asynchronous 3-phase machine	٣
11	آلة تيار مستمر بملف تسلسلي series wound dc machine	٣
12	آلة تيار مستمر بملفات مختلطةcompound wound dc machine	٣
13	آلة متواقتة تيار متناوبةsynchronous AC machine	٣
14	آلة تيار ثلاثية الأوجه ذو الحلقة المنزلقة	٣

	slip ring machine	
٣	آلة محرك مكثف أحادي الطورcapacitor motor machine	15
٣	وحدة اختبار وفحص المحركات والمولدات motor/generator test system	16
٣	جهاز مضخم عزلisolation amplifier	17
٣	مفتاح حماية للمحركات ٣ فاز motor protection switch	18
٣	مفتاح بنديل نجمة / دلتا Star/delta switch	19
٣	مولد تاكو لقياس السرعة tacho generator	20
٣	مقاومة تحكم بالمحركmotor regulated resistor	21
٣	مقاومة تحكم بالمجال field regulator resistor	22
٣	رابط مطاطية وأغطية واقية coupling and coupling guard	23
٣	مصدر تغذية جهد ثلاثي الأوجه 3-phase AC power supply	24
٣	منبع جهد رقمي DC power supply	25
٣	منبع جهد متغيرAC /DC Variable AC/DC Power supply	26
٣	جهاز قياس متعدد الأغراض Digital Multimeter	27
٣	جهاز لقراء القدرة الفعالة والغير الفعالةPower meter	28
٣	جهاز لقياس معامل القدرة power factor meter	29
No of units	اسم الجهاز	ت
٣	مجموعة اسلاك التوصيلconnecting leads	30
٣	طاولة جانبيةTrolley table	31
٣	دواليب لحفظ الأجهزةstorage cabinets	32
٣	إطار حامل للأجهزة مدعم لمنع الانحناءpanel frame	33
١	طاولة التوليد والتزامنgeneration and synchronization	34
١	آلة متواقتةsynchronous machine	35
١	جهاز تحكم في توتر التهييج للالة المتواترة excitation voltage controller	36
١	وحدة تزامن رقميةsynchronization unit	37
١	مبين تزامنsynchronization indicator	38
١	مقارن للطورsynchroscope	39
١٢	نموذج لقاطع ثلاثي power circuit braker	40
١	مقياس توترdouble voltmeter	41
١	جهاز قياس ذبذبة مزدوج double frequency meter	42
١	وحدة تحكم للقدرة الفعالة للالة المتواقتة active power controller	43

44	generatorوحدة تحكم للقدرة غير الفعالة للالة المتواقتة reactive power controller	١
45	control voltageوحدة تحكم التردد للالة المتواقتة controller	١
46	Pendulum machine ماكينة لقياس عزم الالة المتواقتة	١
47	وحدة تحكم للماكينة السابقة control unit for pendulum machine	١
48	coupling guard 1نهاية ربط	٣
49	نهاية حماية shaft end guard	٢
50	مولد تاكو taco generator	٢
51	resistive loadحمل مقاومات	٣
52	inductive loadحمل ردي	٣
53	capacitive load حمل سعوي	٣
54	transmission line studyطاولة دراسة خطوط النقل	٢
55	transmission line modelنموذج لخط نقل	٢
56	محول ثلاثي الأوجه three phase transformer	٢
57	transmission line مكثف ثلاثي الأوجه لخط النقل capacitor	٢
58	محول تيار أحادي الوجه single phase current transformer	١
59	حمل لمحول تيار أحادي الوجه load for single phase current transformer	١
60	محول جهد أحادي الوجه Single phase voltage transformer	١
61	مقياس قدرة رقمي power analyzer	٣
62	مقياس متعدد رقمي Digital Multimeter	٣
63	tachometer infra contactتاكو بالليزر واللمس	١
64	طاولة دراسة الطاقة واستهلاكها energy consumption study	١
65	magnetic powder brakeحمل مغناطيسي مع وحدة التحكم	١
66	وحدة تحكم للبطاريات مع وحدة يثبت معامل القدرة battery control unit	١
67	مربط Coupling	٤
68	safety leads 25cmأسلاك توصيل	٤
69	safety leads 50 cm أسلاك توصيل	٤
70	safety leads 100 cm أسلاك توصيل	٤
71	مجموعة أسلاك توصيل 32 safety connecting leads	٤
72	قناطر safety bridging plugs black	١٢
73	قناطر safety bridging plugs green/yellow	٨
74	قناطر bridging plugs with tap	٦

75	كتب التجارب المعمل books for lab experiments	١
76	آلة تيار قفص سنجابيsquirrel current machine	١

مختبر تقنية إلكترونيات القوى والمحركات
Power Electronics and Drives Technology Lab

ت	أسم الجهاز	عدد الوحدات
١	طاولة عمل Working Table	٤
٢	اطار حامل لقطع التجارب panel frame	٤
٣	مصدر جهد مستمر dc power supply	٤
٤	مصدر جهد متغيرreference variable generator	٤
٥	دايود Diode	٢٤
6	لوحة تايرستورthyristor	٢٤
7	لوحة ترياكtriac panel	١٢
8	لوحة موسفيتmosfet panel	١٢
9	تايرستور GTOلوحة gto thyristor panel	٤
10	لوحة مصهراتthree fold fuse	٤
11	محول مصدر جهد ثلاثي الأطوارtransformer	٤
12	حمل لدوائر إلكترونيات القدرة Load	٤
13	لوحة إشعال التايرستور ٢ نبضةcontrol unit two pulse single phase	٤
14	لوحة تحكم ٦ نبضة control unit six pulse three phase	٤
15	لوحة تحديد مدى زوايا الإشعالTrigger point limiter	٤
16	وحدة تحكمPFM,PWM control unit PFM PWM	٤
17	لوحة مكثفاتcapacitor panel	٤
18	لوحة توحيد قنطرة Rectifier	٤
19	مولد ذبذباتfunction generator	٤
20	مضخم عزل isolation amplifier	٤
21	وحدة تحكم بدء التشغيل run-up control unit	٤
22	محول مبدلة ثايروتيةthyristor speed control unit	٤
23	آلة تيار مستمر بملف تفرعي shunt wound dc machine	٤
24	مولد تاكو لقياس السرعة tacho generator	٤
25	وصلات ربط مطاطيةcoupling	٤
26	غطاء الأجزاء الدوارة في المحركاتcoupling guard	٤
27	قالبة صناعية للتيار المتناوب ac convertor	٤
28	محرك قفص سنجابيsquirrel gauge motor	٤
29	جهاز قياس متعدد ثلاثي الاوجه	٤

	multi-measuring instrument	
٨	جهاز ملتميتر رقمي digital multimeter	30
٤	جهاز راسم اشارة analog oscilloscope	31
٤	مجموعة اسلاك توصيل Leads	32
١٦	اسلاك BNC/4mm , BNC/BNC leads	33
١٢	قناطر توصيلBridges	34
٣	دواليب تخزين Storage cabinets	35
٣٠	كرسي طالب Chairs	36

4 Microprocessor Lab

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

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 and controlling the microprocessor features (stack, interruptions, addressing modes etc), 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, LCD display)

The mechatronics experiment focus on the PIC programming in assembly and C language using MPLAB and PIC compiler, student will practice how to control different electronic components and how to apply clean code concepts in their program.

Equipment:

1. Mechatronics Training Set (Y-0037 Experiment Set)
2. MDA training kit

5. Mechatronics and Control Laboratory:

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

Purpose:

The Mechatronics and control part let students practice the analogue systems control through experimentation. By using RYC units, they can study the behavior of 1st and 2nd 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 equipments.

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

Equipment:

1.	RYC control unit
2.	PLC unit
3.	PLC base station

6. Digital Logic Laboratory

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

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 and Hexadecimal Driver/Decoder, Tri-State Buffer & 4066 Analog Switching IC, K-Maps and Boolean Algebra, Combinational logic Design and Analysis, and Sequential logic Design and Analysis.

Equipment:

2. Digital Logic Training Set (Y-0010 Experiment Set)
3. Digital Logic Training Set (Y-0020 Experiment Set)
4. Bread Boards with wires for connections with full set of digital logic chips

7. Electronic and Electrical Circuits Laboratory:

The Circuits and Measurements 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.

Equipment's:

4.	Digital Multimeter	5.	Oscilloscope
6.	Power meter	7.	Measurement Device with Middle Indicator
8.	Digital Multimeter	9.	Multimeter
10.	magnetic powder brake	11.	Variable Resistor
12.	DC voltage source	13.	Variable Capacitor
14.	AC Power supply	15.	Function generator
16.	Function generator	17.	MOSFET panel

8. Communication Systems Fundamentals Laboratory

The Communication Systems Fundamentals Lab is located Building #11 and room# 2141

Purpose:

The Communication Systems Fundamentals Laboratory is one of the major laboratories of the EE department, King Faisal University. 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 AM Modulation and Demodulation, FM Modulation and Demodulation, PAM, PCM …etc. In addition, The ability to use communication test & measurement instruments

such as oscilloscopes, CASSY, etc. We guide our students on the path of becoming experts in the area of Communication Systems. Some of the Equipments used in the Lab are

PC (Matlab and Cassy must be installed), Function Generator, Oscilloscope, Coaxial Cables, AM modulator and AM demodulator, FM modulator and FM demodulator, PAM modulator and PAM demodulator, PCM Modulator and PCM Demodulator.

Equipment:

1. Educational laboratory Virtual instrumentation Suite programmable using LabVIEW, connects to a PC using USB port, includes the following 12 integrated instruments	2. PCM transmitter
3. Plug-in communications board for the educational laboratory suite fully programmable with LabVIEW.	4. PCM demodulator
5. 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.	6. Oscilloscope
7. magnetic powder brake	8. Digital multimeter
9. DC voltage source	10. data acquisition system
11. AC Power supply	12. Fiber Optic transmitter
13. Function generator	14. Fiber Optic receiver
15. dc power supply	16. Set of FSMA optical fibers
17. function generator	18. optical waveguide
19. AM transmitter	20. optical power meter
21. AM receiver	22. Fiber Micro-positioner
23. FM/PM Modulator	24. plug-in panel
25. FM/PM Demodulator	26. wireless transmitter
27. ASK/FSK/PSK transmitter	28. wireless receiver
29. ASK receiver	30. DSP kit
31. FSK/PSK receiver	32. Spectrum Analayzer
33. PAM modulator	34. Network Analayzer
35. PAM demodulator