



كلية الهندسة التكنولوجية



جامعة البلقاء التطبيقية

الخطط الدراسية لبرنامج الشهادة

الجامعية المتوسطة

تخصص الأتمتة الصناعية

2008/2009



بإشرافه عميد الكلية الأستاذ الدكتور قاسم جابر

Curriculum for Associate Degree in Industrial Automation Specialization

The curriculum of associate degree in “Industrial Automation” specialization consists of (72 credit hours) as follows:

Serial No.	Requirements	Credit Hours
First	University Requirements	12
Second	Engineering Program Requirements	17
Third	Specialization Requirements	43
Total		72



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

***The study plan of a diploma degree in
Industrial Automation***

First: University requirements (12 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
22001101	Arabic Language	3	3	-	
22002101	English Language	3	3	-	
21901100	Islamic Culture	3	3	-	
21702101	Computer Skills	3	1	4	
Total		12	10	4	

Second: Engineering Program requirements (17 credit hours) as follows:

Course No	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20201111	Engineering Workshops	1	-	3	-
20204111	AutoCAD	2	-	6	-
20506111	Occupational Safety	2	2	-	-
21301111	General Mathematics	3	2	2	-
21302111	General Physics	3	2	2	-
21302112	General Physics Laboratory	1	-	3	-
21702111	Communication Skills and Technical Writing	3	2	2	22002101
20201121	Engineering Materials	2	2	-	-
Total		17	10	18	



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Third: Specialization Requirements (43 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20301113	Electrical Circuits	3	3	-	21302111*
20301114	Electrical Circuits lab	1	-	3	203011138
20403111	Electronics	3	3	-	20301113*
20403112	Electronics Lab	1	-	3	20403111*
20404121	Digital Fundamentals	2	2	-	20403111
20404122	Digital Fundamentals Laboratory	1	-	3	20404121*
20401111	Power Electronics	3	3	-	20403111
20401112	Power Electronics Lab	1	-	3	20401111*
20304111	Electrical Machines	3	3	-	20301113
20304112	Electrical Machines Lab	1	-	3	20304111*
20307211	Control Technology	2	2	-	-
20307212	Control Technology Laboratory	1	-	3	20307211*
20307231	Electrical Motor Drive Systems	3	3	-	20304111
20307232	Electrical Motor Drive Systems lab	1	-	3	20307231*
20404211	Microprocessors	3	3	-	20404121
20404212	Microprocessors Laboratory	1	-	3	20404211*
20307221	Programmable Logic Controllers	3	3	-	20404121
20307222	Programmable Logic Controllers Laboratory	1	-	3	20307221*
20304241	Protection and Control Devices	2	2	-	-
20304242	Protection and Control Devices Lab.	1	-	3	20304241*
20307291	Training**	3	-	-	-
20307292	Project	3	-	-	-
Total		43	27	30	-

* Co-requisite

** Equivalent to 280 training hours

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Guiding Plan

First Year					
First Semester			Second Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
22002101	English Language	3	22001101	Arabic Language	3
21702101	Computer Skills	3	20204111	AutoCAD	2
20201121	Engineering Materials	2	20506111	Occupational Safety	2
21901100	Islamic Culture	3	20201111	Engineering Workshops	1
21301111	General Mathematics	3	20404121	Digital Fundamentals	2
20403111	Electronics	3	20301113	Electrical Circuits	3
20403112	Electronics Lab.	1	20301114	Electrical circuits Lab.	1
			21302111	General Physics	3
			21302112	General Physics Lab.	1
Total		18	Total		18

Second Year					
Third Semester			Fourth Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
20401112	Power Electronics Lab.	1	20307221	PLCs	3
20304241	Protection and Control Devices	2	20307222	PLCs Lab.	1
20304242	Protection and Control Devices Lab.	1	20307291	Training	3
20404122	Digital fundamentals Lab.	1	20307292	Project	3
20304111	Electrical Machines	3	20307231	Electrical Motor Drive Systems	3
20307211	Control Technology	2	20307232	Electrical Motor Drive Systems Lab.	1
20307212	Control Technology Lab.	1	20404211	Microprocessors	3
20304114	Electrical Machines Lab.	1	20404212	Microprocessors Lab.	1
20401111	Power Electronics	3			
21702111	Communication Skills and Technical writing	3			
Total		18	Total		18

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Description for Associate Degree in Engineering Program Specializations University Requirements

Course Title	Course No	Credit Hours (Theoretical /Practical)
Arabic Language	22001101	3 (3-0)
<p>تتضمن هذه المادة مجموعة من المهارات اللغوية بمستوياتها وأنظمتها المختلفة: الصوتية، والصرفية، والنحوية، والبلاغية، والمعجمية، والتعبيرية، وتشتمل نماذج من النصوص المشرفة: قرآنية، وشعرية، وقصصية، من بينها نماذج من الأدب الأردني؛ يتوخى من قراءتها وتدوقها وتحليلها تحليلًا أدبيًا؛ تنمية الذوق الجمالي لدى الطلاب الدارسين.</p>		
English Language	22002101	3 (3-0)
<p>English 1 is a general course. It covers the syllabuses of listening, speaking, reading, writing, pronunciation and grammar, which are provided in a communicative context. The course is designed for foreign learners of the English language, who have had more than one year of English language study. The extension part would be dealt with in the class situation following the individual differences.</p>		
Islamic Culture	21901100	3 (3-0)
<ol style="list-style-type: none"> 1. تعريف الثقافة الإسلامية وبيان معانيها وموضوعاتها والنظم المتعلقة بها – وظائفها وأهدافها. 2. مصادر ومقومات الثقافة الإسلامية والأركان والأسس التي تقوم عليها. 3. خصائص الثقافة الإسلامية. 4. الإسلام والعلم، والعلاقة بين العلم والإيمان 5. التحديات التي تواجه الثقافة الإسلامية. 6. رد الشبهات التي تثار حول الإسلام. 7. الأخلاق الإسلامية والآداب الشرعية في إطار الثقافة الإسلامية. 8. النظم الإسلامية. 		
Computer Skills	21702101	3 (1-4)
<p>An introduction to computing and the broad field of information technology is given. Topics covered include the basic structure of digital computer system, microcomputer, operating systems, application software, data communication and networks, and the internet. Hands-on learning emphasizes Windows xp, MS-office2000, and the internet.</p>		

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Engineering Program requirements

Engineering Workshops	20201111	1 (0-3)
Development of basic manual skills in Mechanical and Electrical works. Use of manual tools and measuring devices. Hand filing, welding, metal cutting and forming. Electrical wiring.		
AutoCAD	20204111	2 (0-6)
Introduction to AutoCAD, application of AutoCAD, commands, geometric entities. Geometric construction. Dimensioning, free –hand sketching, object representation, orthographic drawing and projections.		
Occupational safety	20506111	2 (2-0)
Role of technicians in economic development First aid accident prevention. Protective devices and equipment. Industrial safety standards. Nature of fire hazards. Sand fire regulations. Physiological effects of electrical shock on human body. First aid and treatment for the effects of electric shock. Rules of spare and chemicals storage and handing.		
Communication Skills and Technical Writing	21702111	3 (2-2)
The main goal of this course is to equip the students with the necessary communication skills in everyday life & work situations and improve their abilities in technical writing to meet market needs. For this course, the English language is the language of teaching & the means of communication for all classroom situations.		
Engineering Materials	20201121	2 (2-0)
Definition of engineering materials. Classification of materials and their properties. Metallic and non-metallic materials. Metals, alloys and composite materials. Conductors, insulators and semiconductors. Mechanical, Magnetic, Thermal and electrical characteristics of materials. Industrial applications of different types of materials.		
General Mathematics	21301111	3 (2-2)
Real numbers coordinate planes, lines, distance and circles. Functions: (operations and graphs on functions), limits, continuity, limits and continuity of trigonometric functions. Exponential and logarithmic functions. Differentiation (techniques of differentiation, chain rule, implicit differentiation). Application of differentiation (increase, decrease, concavity). Graphs of polynomials. Applications: Rolle's Theorem and Mean-Value Theorem, Integration (by substitution, definite integral, fundamental theorem of Calculus). Application of definite integral (area between two curves, volumes)		
General Physics	21302111	3 (2-2)
Physics and measurement, motion in one dimension, vectors, laws of motion, circular motion, energy and energy transfer, potential energy, linear momentum and collisions, electric fields, Gauss's law, electric potential, capacitance and dielectrics, current and resistance, direct current circuits, magnetic fields, sources of the magnetic field, and Faraday's law of electromagnetic induction.		
General Physics lab	21302112	1 (0-3)
In this course, the student performs thirteen experiments in mechanics and in electricity.		

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Specialization Requirements

Electrical Circuits	20301113	3 (3-0)
Voltage, Current, and Resistance, Ohm's Law, Energy and Power, Series-Parallel Circuits, Introduction to Alternating Current and Voltage, Capacitors, Inductors, RLC Circuits and Resonance. Electrical Measurements.		
Electrical Circuits Lab.	20301112	1 (0-3)
DC and AC circuits. Resonance. Measuring devices.		
Electronics	20403111	3 (3-0)
Semiconductor devices. Diodes: classification, characteristics and applications. Transistors: classification, characteristics and applications. Amplifiers. Oscillators. Logic gates and Integrated circuits: Basic functions, symbols and applications. Introduction to electronic measurements: Oscilloscope applications.		
Electronics Lab.	20403112	1 (0-3)
Use of oscilloscope in measurements. Investigation of characteristics of semiconductor devices. Construction and study of electronic circuits. Experiments in electronics have to cover the main electronic devices (diode, zener diode, diode applications, BJT, FET, op – amp, oscillator, SCR).		
Digital Fundamentals	20404121	2 (2-0)
Study of numerical systems, theory of Boolean algebra and logic circuits, applications to different types of circuits, study of flip-flops, counters, registers and accumulators, digital system memory including ROM, RAM, and EPROM.		
Digital Fundamentals Lab.	20404122	1 (0-3)
Testing and troubleshooting instruments, Logic circuits, adders, comparators, encoders and decoders, flip-flops, counters, registers, memories RAM, ROM, EPROM.		
Power Electronics	20401111	3 (3-0)
Principles and Methods of Electric Power Conversion. Complementary Components and Systems. AC-to-DC Converters. AC-to-AC Converters. DC-to-DC Converters. DC-to-AC Converters. Switching Power Supplies. Power Semiconductor Devices. List of Principal Symbols. Semiconductor Power Switches. Phase-Controlled Converters. . Cycloconverters. Voltage-Fed Converters. Current-Fed Converters. Choppers. Basic calculations. Waveforms. Applications		
Power Electronics Lab.	20401112	1 (0-3)
Test of semiconductor devices. Investigation of characteristics of power electronics devices. Investigation of rectifier, chopper, and inverter circuits under different loads (R, L-loads).		

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Control Technology	20307211	3 (3-0)
Basic concepts. Open-loop and closed loop control systems. Representation of systems using block diagrams, transfer functions and frequency characteristics. Modes of linear control. Controller tuning. PC-based control systems.		
Control Technology Lab.	20307212	1 (0-3)
Experimental study and investigation of open-loop and closed loop systems and their elements using mathematical and physical models. Study of first and second order systems performance		
Electrical Machines	20304111	3 (3-0)
This course throws light on all types of electrical machines ,transformers ,motors , ,generators ,special machines ,These machines which may face a diploma holder in his practical life ,He must be aware of many related things about these machines ,construction ,principles of operation , characteristics , applications , maintenance .		
Electrical Machines Lab.	20304114	1 (0-3)
This course focus ,on connection of various types of electrical machines , measurement of losses and efficiency ,speed control and mechanical characteristics of types of motors ,external characteristics of generators.		
Electrical Motor Drive Systems	20307231	3 (3-0)
Definition of electrical drive system. Elements of electrical drive system. DC and AC drive systems. Conversion of electrical energy into mechanical energy. Transmission of mechanical power. Main characteristics and modes of drive systems. Principles of speed control in drive systems using timers, relays, limit switches and speed signals. Open-loop speed control using variable voltage, flux and resistance in armature circuit. Closed-loop control of motor speed. Servo drives systems. Static control using ICs, and microprocessors		
Electrical Motor Drive Systems Lab.	20307232	1 (0-3)
Investigation of torque/speed characteristics of drive systems. Automatic start, stop and reverse of drive systems. Speed control. Effect of feedback on torque/ speed characteristics. Servo drives		
Microprocessors	20404211	3 (3-0)
Introduction to microprocessors architecture, instruction set, assemblers and assembly language programming, software development, microprocessors applications.		
Microprocessors Lab.	20404212	1 (0-3)
Data transfer, Arithmetic Operations, Looping, Subroutines, General programs, Applications.		

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Protection and Control Devices	20304241	2 (2-0)
Basic concepts and definitions. Normal and up-normal operating conditions. Faults and their causes. Protection. Protection devices: classification, applications, basic structure and principle of operation, characteristics. Ratings of protection devices, troubleshooting and calibration. Selection of protection devices.		
Protection and Control Devices Lab.	20304242	1 (0-3)
The course aims at giving the students practical skills in order to select ,wire troubleshoot and maintain the most common control and protection devices like fuses ,circuit breakers , relays ,contactors ,timers ,switches ,and measuring transformers		
Programmable Logic Controllers	20307221	3 (3-0)
Comparison between relays and programmable controllers, basic structure of PLC, cycle-scan. CPU memory, Registers, timers, and counters addresses I/O modules, interfacing programming instructions, Programming devices programming procedures, peripheral equipments, troubleshooting and maintenance		
Programmable Logic Controllers Lab.	20307222	1 (0-3)
Realizing a definite number of cycle for two double acting cylinders, Realizing a discrete time-driver sequential control system by using limit switches or proximity switches, Realizing a discrete time-driver sequential control system, Investigating TON and TOFF timers with practical application, Investigating TRTG and TMOPN timers with practical application, Investigating UP and Down counters with practical application, Investigating UP- down and ring counter with practical application, Application of duty – cycle generator to generate train of pulses, Application of function : move , compare rotate and shift registers , and set-reset function		
Training	20307291	3 (280 training hours)
Equivalent to (280 hours) of field training targeted to emphasize the ability of students to apply the theories in the real world of the profession.		
Project	20307292	3
An integrated assembly/design practical work related to the major fields of study.		





Engineering Program

Specialization	Electro-mechanical program
Course Number	20307212
Course Title	Control Technology Laboratory
Credit Hours	1
Theoretical Hours	-
Practical Hours	3
Pre-requisite	20307211*



Brief Course Description:

Experimental study and investigation of open-loop and closed loop systems and their elements using mathematical and physical models. Study of first and second order systems performance

Course Objectives:

Upon the completion of this course, the student will be able to:

1. Build simple control loops and systems
2. Distinguish between real systems and their models
3. Evaluate performance of simple control systems
4. Use PC in simple control actions

Detailed Course Outline:

Unit Number	Unit Title	Unit Content	Time Needed
1.	Elements of automatic control system	▪	
2.	Feedback control and control loop diagrams	▪	
3.	Stability of automatic control systems	▪	
4.	Frequency characteristics and their applications in automatic control systems	▪	
5.	Process time lags	▪	
6.	Servo and motion control systems	▪	
7.	Two position control systems	▪	
8.	PID generic controllers	▪	
9.	Controller tuning	▪	
10.	Examples of motion control systems	▪	
11.	PC-based control systems	▪	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Evaluation Strategies:

Exams		Percentage	Date
Exams	Midterm practical Exam	20%	
	Reports	30%	
	Final practical Exam	50%	

Teaching Methodology:

- ❖ Practical experimental work in small groups

Text Book

1. Laboratory sheets prepared by instructor



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Electro-mechanical program
Course Number	20307211
Course Title	Control Technology
Credit Hours	2
Theoretical Hours	2
Practical Hours	-
Pre-requisite	-





Brief Course Description:

Basic concepts. Open-loop and closed loop control systems. Representation of systems using block diagrams, transfer functions and frequency characteristics. Modes of linear control. Controller tuning. PC-based control systems.

Course Objectives:

Upon the completion of this course, the student will be able to:

1. Understand the fundamental control knowledge.
2. Develop creative thinking ability in modern control technology.
3. Develop problem solving skills.
4. Develop learn, how to learn skills and apply learned knowledge in real technical environment.



Detailed Course Outline:

Unit Number	Unit Title	Unit Content	Time Needed
1.	Fundamentals of automatic control	▪	
2.	Elements of automatic control system	▪	
3.	Feedback control and control loop diagrams	▪	
4.	Transfer functions of first and second order elements	▪	
5.	Stability of automatic control systems	▪	
6.	Frequency characteristics and their applications in automatic control systems	▪	
7.	Process time lags	▪	
8.	Servo and motion control systems	▪	
9.	Two position control systems	▪	
10.	PID generic controllers	▪	
11.	Controller tuning	▪	
12.	Examples of motion control systems	▪	
13.	Introduction to PC-based control systems	▪	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homeworks and quizzes		10%	

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Teaching Methodology:

- ❖ Lectures and discussions

Text Book

1. Industrial control handbook, Hong Kong IGDS 2000, Hong Kong Polytechnic University
2. Modern control technology: Components and systems, second edition, Kallian Delmar

References

1. Instrumentation and control, volume 2 of 2-1992, U.S. department of energy. FSC-6910. Washington D.C 20585.





Engineering Program

Specialization	Common
Course Number	20404121
Course Title	Digital Fundamentals
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

وصف المادة الدراسية:

- ❖ Study of numerical systems, theory of Boolean algebra and logic circuits, applications to different types of circuits, study of flip-flops, counters, registers and accumulators, digital system memory including ROM, RAM, and EPROM.

أهداف المادة الدراسية:

1. To be familiar with number systems and its conversion.
2. To understand logic functions, gates, and Boolean algebra.
3. To understand combinational circuits.
4. To understand sequential logic circuits.
5. To be familiar with different types of memory.



الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.	NUMBERS SYSTEM AND CODES	<ul style="list-style-type: none"> ▪ Introduction ▪ Decimal, binary, octal and hexadecimal numbers system ▪ Number system conversion ▪ Binary arithmetic ▪ 1's and 2's complement of binary number ▪ binary coded decimal (BCD) ▪ digital coded (Gray, Excess-3 and ASC II codes) 	2 Weeks
2.	LOGIC GATES	<ul style="list-style-type: none"> ▪ The inverter ▪ The AND gate ▪ The OR gate ▪ The NAND gate ▪ The NOR gate ▪ The Exclusive-OR and Exclusive-AND gates ▪ Application of logic gates in industry 	2 Weeks
3.	BOOLEAN ALGEBRA AND LOGIC SIMPLIFICATION	<ul style="list-style-type: none"> ▪ Boolean operation and expressions ▪ Laws and rule of Boolean algebra ▪ De Morgan's theorem ▪ Simplifications using Boolean algebra ▪ Standard forms of Boolean expression ▪ The Karnaugh map ▪ Karnaugh map minimization 	2 Weeks
4.	COMBINATIONAL LOGIC	<ul style="list-style-type: none"> ▪ Implementing combinational logic ▪ The universal property of NAND and NOR gates ▪ Implementation using NAND and NOR gates ▪ Operation with pulse waveforms ▪ Troubleshooting and application 	2 Weeks
5.	FUNCTIONS OF COMBINATIONAL LOGIC	<ul style="list-style-type: none"> ▪ Half adders, full adders, parallel adders ▪ Comparators ▪ Encoders and decoders ▪ Multiplexing 	2 Weeks

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		<ul style="list-style-type: none"> Application 	
6.	FLIP-FLOPS	<ul style="list-style-type: none"> Sequential logic circuits Edge-triggered Flip-Flops (S-R, J-K, D) Master-slave Flip-Flops Flip-Flop operation characteristic Flip-Flops application 	2 Weeks
7.	COUNTERS	<ul style="list-style-type: none"> Asynchronous counters Synchronous counters Up/Down synchronous Cascaded counters Counter application 	2 Weeks
8	SHIFT REGISTERS	<ul style="list-style-type: none"> Basic shift registers functions Serial in / serial out shift registers Serial in / parallel out shift registers parallel in / serial out shift registers parallel in / parallel out shift registers 	Week
9	MEMORIES	<ul style="list-style-type: none"> Basic of semiconductors memories Read-only memories (ROMs) Programmable ROMs (PROMs and EPROMs) Read/Write Random –Access Memories(RAMs) Memory expansion 	Week

	%20	الأول
	%20	الثاني
	%10	أعمال الفصل
	%50	الامتحانات النهائية
		المشروع و الوظائف المناقشات وتقديم المحاضرات

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طرق التدريس:

1. محاضرات
2. مناقشات
3. عروض power point

الكتب والمراجع:

1. Tomas Floyd “Digital Fundamentals” sixth edition, Prentice-Hall, Inc.NJ.,USA,1997
2. William Kleitz, “Digital Electronics a practical approach” third edition, prentice-Hall career &technology Englewood Clifts, NJ.,USA, 1993.
3. Morris Manor: digital design, Prentice Hall





Engineering Program

Specialization	Common
Course Number	20404122
Course Title	Digital Fundamentals Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

وصف المادة الدراسية:

- ❖ Testing and troubleshooting instruments, Logic circuits, adders, comparators, encoders and decoders, flip-flops, counters, registers, memories RAM, ROM, EPROM

أهداف المادة الدراسية:

1. This lab course is to provide an introduction to the characteristics of digital logic and the design, construction, testing and debugging of simple digital circuits.



الوصف العام:

رقم التجربة	اسم التجربة	محتويات التجربة	الزمن (أسبوع)
1.	Testing and troubleshooting instruments		Week
2.	Logic gates	NOT, OR, AND, NOR, NAND, XOR, XNOR	2 Weeks
3.	Boolean algebra and Demorgan theorems		Week
4.	Karnaugh maps		Week
5.	Half-adders , full adders , and parallel adders		Week
6.	comparator		Week
7.	encoders		Week
8.	Decoders and seven-segment display		Week
9.	Multiplexer and de-multiplexer		Week
10	Flip-flop		Week
11.	Asynchronous counters		Week
12	synchronous counters		Week
13	Registers		Week
14	memories		Week
15	ALU (Arithmetic Logic Unit)		Week

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طرق التقييم المستخدمة:

التقارير و المشاركة	30%	
الامتحان المتوسط	20%	
الامتحان النهائي	50%	
المشروع و الوظائف		
المناقشات و تقديم المحاضرات		

طرق التدريس:

1. المختبر
2. تطبيق التجربة
3. المناقشة
4. عروض power point

الكتب والمراجع:

1. كراسة مختبر الالكترونيات الرقمية / اعداد : مدرس المادة
2. William Kleitz, "Digital Electronics a practical approach" third edition, prentice-Hall career &technology Englewood Clifts, NJ.,USA, 1993.
3. Morris Manor: digital design, Prentice Hall





Engineering Program

Specialization	Common Course
Course Number	20301113
Course Title	Electrical Circuits
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



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وصف المادة الدراسية:

- ❖ Voltage, Current, and Resistance, Ohm's Law, Energy and Power, Series-Parallel Circuits, Introduction to Alternating Current and Voltage, Capacitors, Inductors, RLC Circuits and Resonance. Electrical Measurements.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Define and study current and voltage sources.
2. Use Ohm and kirchoff's laws for analyzing DC electrical circuits.
3. Study the elements of AC circuits.
4. Study the RLC in AC circuits.



الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن بالاسبوع
1.	Voltage, Current, and Resistance	<ul style="list-style-type: none"> ▪ Atomic Structure ▪ Electrical Charge ▪ Voltage, Current, and Resistance ▪ Voltage and Current Sources ▪ Resistors ▪ The Electric Circuit ▪ DC Circuit Measurements ▪ Electrical Safety 	2
2.	Ohm's Law, Energy and Power	<ul style="list-style-type: none"> ▪ The Relationship of Current, Voltage, and Resistance ▪ Calculating Current ▪ Calculating Voltage ▪ Calculating Resistance ▪ Energy and Power ▪ Power in an Electric Circuit ▪ Resistor Power Ratings ▪ Energy Conversion and Voltage Drop in Resistance ▪ Power Supplies 	2
3.	Series Circuits	<ul style="list-style-type: none"> ▪ Resistors in Series ▪ Current in a Series Circuit ▪ Total Series Resistance ▪ Application of Ohm's Law ▪ Voltage Sources in Series ▪ Kirchhoff's Voltage Law ▪ Voltage dividers ▪ Power in Series Circuits 	1

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



4.	Parallel Circuits	<ul style="list-style-type: none"> ▪ Resistors in Parallel ▪ Voltage in a Parallel Circuit ▪ Kirchhoff's Current Law ▪ Total Parallel Resistance ▪ Application of Ohm's Law ▪ Current Sources in Parallel ▪ Current Dividers ▪ Power in Parallel Circuits 	1
5.	Series-Parallel Circuits	<ul style="list-style-type: none"> ▪ Identifying Series-Parallel Relationships ▪ Calculations of Series-Parallel Resistive Circuits ▪ Voltage Dividers with Resistive Loads ▪ The Wheatstone Bridge ▪ The Superposition Theorem 	3
6.	Introduction to Alternating Current and Voltage	<ul style="list-style-type: none"> ▪ The Sinusoidal Waveform ▪ Sinusoidal Voltage Sources ▪ Sinusoidal Voltage and Current Values ▪ Angular Measurement of a Sine Wave ▪ The Sine Wave Formula ▪ Introduction to Phasors ▪ Analysis of AC Circuits ▪ Superimposed DC and AC Voltages ▪ Nonsinusoidal Waveforms ▪ The Oscilloscope ▪ Concepts of phasors, complex numbers, rectangular and polar forms of complex numbers, mathematical operations. ▪ Three-phase voltage and current 	5

		<ul style="list-style-type: none"> ▪ Y and Δ connections ▪ Line and phase voltages and currents ▪ Power calculations in three-phase circuits ▪ Generation of three phase voltage ▪ Inter connections of three phase voltage and currents in star connection (Y) and delta connection (Δ) ▪ Mesh method of connection loads with alternator ▪ Active, reactive and apparent power in three phase circuits <ul style="list-style-type: none"> ▪ Analysis of balanced phase circuits ▪ Balanced and unbalanced three-phase circuits. ▪ AC circuit measurement 	
7.	Capacitors	<ul style="list-style-type: none"> ▪ The Basic Capacitor ▪ Types of Capacitors ▪ Series Capacitors ▪ Parallel Capacitors ▪ Capacitors in DC Circuits ▪ Capacitors in AC Circuits 	1
8.	Inductors	<ul style="list-style-type: none"> ▪ The Basic Inductor ▪ Types of Inductors ▪ Series and Parallel Inductors ▪ Inductors in DC Circuits ▪ Inductors in AC Circuits 	1
9.	RLC Circuits and Resonance	<ul style="list-style-type: none"> ▪ RC Circuits ▪ RL Circuits ▪ RLC Circuits ▪ Resonance circuit 	2

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
	20%	الأول
	20%	الثاني
	10%	أعمال الفصل
	50%	الامتحانات النهائية
		المشروع و الوظائف
		المناقشات و تقديم المحاضرات

طرق التدريس:

❖ يحدد عضو هيئة التدريس الطريقة المستخدمة من خلال (محاضرة، عرض، مناقشات، مختبرات).

الكتب و المراجع :

الكتاب المقرر:

1. Thomas L. Floyd “ principles of electric circuits” ,Prentice Hall, 2007, ISBN-10: 0132383519

المراجع:

1. Robert L. Boylested “introductory circuit analysis” prentice-hall Inc 1997
2. Thomas L. Floyd “ principles of electric circuits” charlese, Merrill publishing company,1981
3. Noel M. Morris and Frank W.Senior “electric circuits analysis” USA NY,1977

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common Course
Course Number	20301114
Course Title	Electrical Circuits Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



وصف المادة الدراسية:

- ❖ DC circuit analysis, Ac circuit analysis, Resonance. Electrical measurements. The Oscilloscope and its applications in measurements.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Measure voltages and currents to verify KVL and KCL.
2. Identify shorts and opens in a malfunctioning circuit, and define and verify the equivalent resistance of a given network
3. Measure the inductance of an inductor.
4. Measure the capacitance of a capacitor.
5. To be familiar with an AC oscilloscope measurement
6. Identify resonance circuit.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن بالاسبوع
1.	Resistor and color code		2
2.	Series DC circuits		2
3.	Series and parallel DC circuits		2
4.	Superposition principles		2
5.	The Oscilloscope		3
6.	RLC components		3
7.	Resonant circuits		2



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
	30%	التقارير و المشاركة
	20%	الامتحان المتوسط
	50%	الامتحان النهائي
		المشروع و الوظائف
		المناقشات و تقديم المحاضرات

طرق التدريس:

❖ تطبيقات عملية في المختبر

الكتب و المراجع :

الكتاب المقرر:

1. أدلة التجارب العملية الخاصة بالمختبر.

المراجع:

1. Robert L. Boylested “introductory circuit analysis” printce-hall Inc 1997
2. Thomas L. Floyd “ principles of electric circuits” charlese, Merrill publishing company,1981
3. Noel M. Morris and Frank W.Senior “electric circuits analysis” USA NY,1977

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304112
Course Title	Electrical Machines (1)
Credit Hours	2
Theoretical Hours	2
Practical Hours	0





□ **Brief Course Description:**

This Course covers ; constructional features , principles of operation, classification , equivalent circuits , parameters evaluation , characteristics , testing and applications of DC machines and transformers .

□ **Course Objectives:**

The student should be able to ;

1. Explain the principles of electromagnetism.
2. Describe the construction of DC machines and methods of excitation.
3. Describe the characteristics of DC generators.
4. Describe the methods of; starting, speed control and reversing the direction of rotation of DC motors.
5. Describe the construction of single – phase transformers.
6. Determine the transformer equivalent circuit, parameters, voltage regulation and efficiency.
7. Explain the methods of connections of three- phase transformer windings.
8. Name the conditions of parallel operations of single – phase and three – phase transformer.



□ Detailed Course Description:

Unit Number	Unit name	Unit Content	Time Needed
1.	Electromagnetic	<ul style="list-style-type: none"> ▪ Introduction. ▪ Motional voltage, e. ▪ Electromagnetic Force, f. ▪ Basic Structure of Electric Machine 	
2.	DC Machine	<ul style="list-style-type: none"> ▪ Construction ▪ Evolution of DC Machine ▪ Armature Windings; Lap winding, wave winding ▪ Armature Voltage ▪ Electromagnetic Torque ▪ Magnetization (saturation) curve of a DC Machine 	
3	DC Generators	<ul style="list-style-type: none"> ▪ Separately Excited DC Generator ▪ Shunt Excited DC Generator ▪ Series Excited DC Generator ▪ Compound Excited DC Generator ▪ Armature Reaction of DC Generators ▪ Current commutation in DC Machine ▪ Characteristic of DC Generators 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

4	DC Motors	<ul style="list-style-type: none"> ▪ Separately Excited DC Motor ▪ Shunt Motor ▪ Series Motor ▪ Compound Motors ▪ Torque – speed characteristics of DC Motors ▪ Power flow and efficiency in DC Machines 	
5	Speed control of DC Motors	<ul style="list-style-type: none"> ▪ Armature Voltage control. ▪ Field control. ▪ Armature Resistance control 	
6	Magnetic circuits of Transformers	<ul style="list-style-type: none"> ▪ I-H Relation ▪ B-H Relation ▪ Magnetic Equivalent circuit ▪ Magnetic curve ▪ Inductance ▪ Hysteresis losses ▪ Eddy current losses ▪ Core losses 	
7	Transformers	<ul style="list-style-type: none"> ▪ Construction of single – phase Transformer ▪ EMF of Transformer ▪ Ideal Transformer ▪ Impedance Transfer ▪ Polarity of Transformer 	



8	Practical Transformer	<ul style="list-style-type: none"> ▪ Referred Equivalent parameters ▪ Determination of equivalent parameters ▪ Transformer Ratings ▪ No- Load Test ▪ Short – circuit Test ▪ Efficiency of Transformer; Maximum Efficiency, All – Day (Energy) Efficiency ▪ Voltage Regulation 	
9	Autotransformers		
10	Three – phase Transformer	<ul style="list-style-type: none"> ▪ Re Bank of three single-phase Transformers ▪ Three – phase Transformer on a common Magnetic core (Three – Phase Unit Transformer) ▪ Parallel Operation of Tree Phase Transformers 	

□





□ **Evaluation Strategies:**

		Percentage	Date
1. Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

□ **Teaching Methodology:**

1. Lecture

□ **Textbook:**

Principles of Electric Machines and power Electronics; P.C. Sen. John Wiley & Sons, INC, 1997.

□ **References:**

1. Electric Machinery Fundamentals; Stephen J. Chapman, Mc GRAW – Hill, 1996.
2. Small Electric motors; (Helmut Moczala, Jurgen Draeger, Herman Kraub, 1998.
3. Electric Machines; M.S sarma, west publishing company, 1994.
4. Electrical Power Technology; D. Tyler, 1998.





Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304113
Course Title	Electrical Machines (2)
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



□ **Brief Course Description:**

This Course covers constructional features, principles of operation, classification, equivalent circuits, parameters evaluation, characteristics, testing and applications of Induction & Synchronous Machines.

□ **Course Objectives:**

The student should be able to ;

1. Describe the construction, types and operation of single & three- phase induction motors.
2. Describe the methods of starting & speed control of single & three- phase induction motors.
3. Describe the construction, operation & application of synchronous machines.
4. Describe methods of starting of Synchronous motors
5. Explain the characteristics of synchronous generators.
6. Understand the parallel operation of synchronous generators.



□ Detailed Course Description:

Unit Number	Unit name	Content	Time Needed
1.	Induction Machines (3-Phase)	<ul style="list-style-type: none"> ▪ Constructional features ▪ Rotating Magnetic field ▪ Induced voltage 	
2.	Polyphase Induction Machine	<ul style="list-style-type: none"> ▪ Standstill operation ▪ Induction regulator ▪ Running Operation 	
3	Modes of operation of Induction Machine	<ul style="list-style-type: none"> ▪ Motoring ▪ Generating ▪ Plugging 	
4	Equivalent circuit of Induction Machine	<ul style="list-style-type: none"> ▪ Stator windings ▪ Rotor Circuit ▪ Complete Equivalent Circuit ▪ Approximate Equivalent Circuit 	
5	Operation of Induction Motors	<ul style="list-style-type: none"> ▪ No- Load Test ▪ Blocked – Rotor Test ▪ Performance Characteristics. ▪ Efficiency and Power Flow 	

6		<ul style="list-style-type: none"> ▪ Types of Induction Motors and speed control. ▪ Wound Rotor Motor. ▪ Squirrel – cage Motors; deep – Bar squirrel cage motor and double- cage squirrel- cage motor. ▪ Speed control; pole changing, line voltage control, line frequency control and Rotor resistance control. ▪ Starting of Induction Motors. 	
7	Single – phase Induction Motors	<ul style="list-style-type: none"> ▪ Introduction ▪ Double revolving field theory; Rotor at standstill, Rotor running, pulsating Torque. ▪ Types of 1- phase Induction Motors; split – phase Motors, capacitor- start Motor, capacitor – start capacitor- Run Motor, shaded – Pole Motor . ▪ Characteristics & typical application. 	
8	Synchronous Machines	<ul style="list-style-type: none"> ▪ Introduction. ▪ Construction of three- phase synchronous machine. ▪ Equivalent circuit of a synchronous machine 	

9	Synchronous Machines	<ul style="list-style-type: none"> ▪ Principle of operation & Types. ▪ Characteristic. ▪ Parallel Operation of Alternators. ▪ Armature Reaction. 	
10	Determination of the Synchronous Reactance X_s	<ul style="list-style-type: none"> ▪ Open- circuit test. ▪ Short – circuit test. ▪ Unsaturated synchronous reactance. ▪ Saturated synchronous reactance. ▪ Phasor diagram. 	
11	Synchronous Motors	<ul style="list-style-type: none"> ▪ Principle of operation ▪ Power & Torque characteristics ▪ Power factor control ▪ Starting of synchronous Motors; starting with variable – frequency supply, starting as an Induction Motor ▪ Speed control of synchronous motor. ▪ Applications 	





□ **Evaluation Strategies:**

		Percentage	Date
1. Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

□ **Teaching Methodology:**

1. Lecture

□ **Textbook:**

Principles of Electric machines and power electrons; P.C.Sen, John Wiley & sons, Inc, 1997.

□ **References:**

1. Electric Machine Fundamentals, Stephen J. Chapman, Mc GRAW-Hill, 1996.
2. Small Electric Motors; (Helmut Moczala, Jurgen Draeger, Herman KrouB, 1998.
3. Electric Machine; M.S Sarma, west publishing Company, 1994.
4. Electrical Power Technology; D.Tyler ,1998.



Engineering Program

Specialization	Common
Course Number	20304111
Course Title	Electrical Machines
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



وصف المادة الدراسية:

This course throws light on all types of electrical machines ,transformers ,motors, ,generators ,special machines ,These machines which may face a diploma holder in his practical life ,He must be aware of many related things about these machines ,construction ,principles of operation , characteristics , applications , maintenance .

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Explain & describe the operating principles, construction of generators.
2. Explain & describe the operating principles, construction of three phase synchronous generators.
3. Explain & describe the operating principles, construction & excitation of DC & AC motors & generators.



الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.	Magnetic Circuits	<ul style="list-style-type: none"> ▪ I-H relation ▪ B-H relation ▪ Magnetic equivalent circuit ▪ Hysteresis losses ▪ Eddy current losses ▪ Core losses 	2 weeks
2.	Transformers	<ul style="list-style-type: none"> ▪ Construction and principle of operation ▪ EMF Equation ▪ Practical transformer; referred equivalent circuit ▪ Open – circuit test ▪ Short – circuit test ▪ Full – load copper losses. ▪ Efficiency ,all – day efficiency ,maximum efficiency ▪ Voltage regulation ▪ Ideal transformer ▪ Auto transformer ▪ Three – phase transformers 	3 weeks
3.	Direct Current Machines	<ul style="list-style-type: none"> ▪ Construction and principle of operation ▪ Armature windings ▪ Developed torque ▪ DC generators, types; characteristics, interlopes, armature reaction , voltage regulation . ▪ DC Motors, types; mechanical characteristics; losses and efficiency speed control 	4 weeks
4.	Three – Phase Induction Motors	<ul style="list-style-type: none"> ▪ Introduction ▪ Construction and types ▪ Rotating magnetic field ▪ Induced E.M.F ▪ Slip 	1 weeks

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<ul style="list-style-type: none"> ▪ Performance characteristics ▪ No – load test ▪ Blocked – rotor test ▪ Speed control ,pole changing , line voltage control; line frequency ▪ Control , rotor resistance control 	
5.	Single – phase Induction Motors	<ul style="list-style-type: none"> ▪ Double revolving field theory ▪ Types , capacitor – start motor ,split – phase motor ; shade – ▪ Pole motor, capacitor – start and run motor, universal motor. ▪ Characteristics and typical applications ▪ Speed control 	2 weeks
6.	Synchronous Machines	<ul style="list-style-type: none"> ▪ Construction of 3-ph synchronous machine ▪ Synchronous generators , principle of operation , types ▪ characteristics , armature reaction , voltage regulation ▪ Synchronous motors , principle of operation , power and torque ▪ characteristics , P.F control speed control , applications 	2 weeks
7.	Special Machines.	<ul style="list-style-type: none"> ▪ DC servomotor, construction and applications. ▪ AC servomotor, construction and applications. ▪ Stepper motor, types, construction and applications. ▪ Linear indication motor ,construction and applications ▪ Linear synchronous motor ,construction and applications 	1 week
8.	Vibration and Noise Problems in Electrical Machines	<ul style="list-style-type: none"> ▪ Introduction ▪ Sound field quantities ▪ Noise measurements ▪ Vibration measurements ▪ Vibration and noise reduction ▪ Sound damping ▪ Technical solutions 	1 week

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
	%20	الأول
	%20	الثاني
	%10	أعمال الفصل
	%50	الامتحانات النهائية

طرق التدريس:

❖ يحدد عضو هيئة التدريس الطريقة المستخدمة من خلال (محاضرة، عرض، مناقشات، مختبرات).

الكتب و المراجع :

1. Principle of Electric Machines and Power Electronics , P.C. Sen , John Wiley and Sons , Inc , 1997
2. Small Electric Motors , Helmut Moczala , Jugen Draeger , Hermann Kraub , 1998
3. Electrical Machines , M.S.Sarma , West Publishing Company , 1994
Electrical machinery Fundamental, Stephen J. Chap man, Mc GRAW , Hill , 1996 .

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Engineering Program

Specialization	Common
Course Number	20304114
Course Title	Electrical Machines Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



وصف المادة الدراسية:

This course focus ,on connection of various types of electrical machines , measurement of losses and efficiency ,speed control and mechanical characteristics of types of motors ,external characteristics of generators.

أهداف المادة الدراسية:

Upon the completion of the course, the student will be able to:

1. Make connection of all type of electrical machines , motors , generators and transformers
2. Measure; power ,current, voltage and cosup of electrical machines
3. Measure sped of different types motor
4. Draw the characteristics of transformers ,motors and generators
5. Calculate the parameters of electrical machines



الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.		Experiments on transformers no- load test, short- circuit test and loading test. Cage type , Capacitor-start motor, shaded- pole type	1 weeks
2.		Experiments on three – phase induction motors; wound rotor type and squirrel	2 weeks
3.		Experiments on single – phase induction motors split phase type ،	3 weeks
4.		Experiments on synchronous machines ; synchronous generator (alternator) and synchronous motor	2 weeks
5.		Experiments on DC motors ;shunt, series, compound	4 weeks
6.		Experiments on DC generators ;shunt, series, compound	4 weeks

❖ تطبيق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
	30%	التقارير
	20%	الامتحان المتوسط
	50%	الامتحانات النهائية

طرق التدريس:

❖ تجارب عملية في المختبر

الكتب و المراجع :

المراجع:

1. Lab. Sheets Prepared by Instructor
2. Manuals of each type of machines.
3. Electric machinery fundamentals, Stephen J.Chapman, 1996.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20403111
Course Title	Electronics
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

وصف المادة الدراسية:

- ❖ This course covers the basic subjects in electronics and you will study: Semiconductor theory , the diode , special purpose diodes , diode applications , bipolar junction transistor (BJT) , field effect transistor (FET) , operational amplifiers, thyristor and other devices.

أهداف المادة الدراسية:

Upon the completion of the course, the student will be able to:

1. Explain the basic structure of atoms.
2. Define and discuss semiconductors, conductors, insulators .
3. Identify the bias and applications of diode, zener ,varactor, and other special diodes.
4. Study of BJT & FET ,oscillators ,operational amplifiers, thyristors and other devices



الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.	Introduction to Semiconductors	<ul style="list-style-type: none"> ▪ Atomic structure ▪ Semiconductors ▪ Conductors ▪ Insulators ▪ Covalent bonds ▪ Conduction in semiconductors ▪ Intrinsic and extrinsic semiconductors ▪ N-type and p- type semiconductors 	2 weeks
2.	The Diode	<ul style="list-style-type: none"> ▪ P-N junction ▪ Biasing the diode ▪ Voltage – current characteristic of diode ▪ DC load line ▪ Operating point ▪ DC and AC resistance ▪ Comparison between silicon and germanium diodes ▪ Data sheet of diode 	3 weeks
3.	Special – Purpose Diode	<ul style="list-style-type: none"> ▪ Zener diode (symbol , structure , principle of operation ▪ Zener diode applications (regular and limiter) ▪ Varactor diode. Light- emitting diode (LED), photodiode 	2 weeks
4.	Applications of The Diode	<ul style="list-style-type: none"> ▪ Half – wave and full – wave rectifiers ▪ Filters and regulators in power supply circuits. 	1 weeks
5.	Bipolar Junction Transistor (BJT)	<ul style="list-style-type: none"> ▪ Introduction ▪ Structure and principle of operation ▪ Characteristics and parameters. 	3 weeks

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<ul style="list-style-type: none"> ▪ Regions of operation ▪ The DC operation point (load line) ▪ BJT as an amplifier and as switch ▪ Voltage divider bias and other bias methods ▪ Basic circuits connection ▪ (C.E, C.C, C.B) amplifier ▪ Data sheet of a BJT 	
6.	Field – Effect Transistor(FET)	<ul style="list-style-type: none"> ▪ Introduction. ▪ Structure and principle of operation of junction field effect transistor (JFET). ▪ JFET characteristics, Parameters and biasing. ▪ Structure and principle of operation of metal oxide semiconductor field effect transistor (MOSFET). ▪ Enhancement and depletion types. ▪ MOSFET characteristics, Parameters and biasing. ▪ FET amplification, connections modes (C.S, C.D, C.G,) amplifiers, data sheet of a JFET and a MOSFET. 	2 week
7.	Oscillators	<ul style="list-style-type: none"> ▪ Introduction ▪ Negative and positive feedback, (basic circuit, principle of operation, oscillation frequency calculation for the following oscillators. Phase – shift oscillator ▪ Colpitts and Hartley oscillators 	1 week

8.	Operational Amplifiers	<ul style="list-style-type: none"> Symbol, terminals and basic op-amp representations (idea and practical) 	1 week
9.	Thyristor and Other Devices	<ul style="list-style-type: none"> Structure ,principle of operation Characteristics curves and applications of the following devices: (Four – layer device, SCR (Silicon – controlled rectifier), siac, triac, Uninjunction transistor (UJT), and phototransistor 	1 week
10.	Introduction to Electronic Measurements	<ul style="list-style-type: none"> Applications of oscilloscope in electronic measurements 	1 week

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
/ / : التاريخ :	%20	الأول
/ / : التاريخ :	%20	الثاني
/ / : التاريخ :	%10	أعمال الفصل
/ / : التاريخ :	%50	الامتحانات النهائية

طرق التدريس:

❖ Lectures

الكتب و المراجع :

1. Thomas L. Floyd, electrical devices, prentice hall international, 6th edition , 2002.
2. Basic operational Amplifiers and Linear Integrated Circuits , David Buchla ,Prentice Hall , 1999.
3. Electronics fundamental and Experiments, Cynthia B. Leshin, David Buchla, Tjomas L. Floyd, prentice hall international ,1999.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20403112
Course Title	Electronics Lab.
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



وصف المادة الدراسية:

- ❖ Lab in support of the basic electronics course, experiments in basic electronics have to cover all electronics devices (diode, zener diode, diode applications, BJT, op – amp ,oscillators ,SCR).

أهداف المادة الدراسية:

Upon the completion of the course, the student will be able to:

1. Become familiar with electronics devices and using data sheet.
2. Demonstrate how to test electronic devices by using AVO meter or through DC measurements.
3. Construct electronic circuit.
4. Investigate characteristics curves.
5. Calculate the value the values of currents and voltage and compare them with measured values



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.	The diode	<ul style="list-style-type: none"> ▪ Forward and reverse biasing. ▪ Characteristic curve. ▪ Data sheet. 	2 weeks
2.	The zener Diode.	<ul style="list-style-type: none"> ▪ Breakdown voltage. ▪ Regulation. ▪ Characteristic curve. ▪ Data sheet 	2 weeks
3.	Rectification Circuits with Filter and Regulator	<ul style="list-style-type: none"> ▪ Half- wave and full- wave. ▪ Ripple factor. ▪ Line and load regulation 	1 week
4.	A BJT testing by using AVO meter , and how to determine the specifications of transistor through data sheets		1 week
5.	A BJT with Voltage – Divider Bias		1 week
6.	A BJT as a switch		1 week
7.	Common Emitter Amplifier Circuit		1 week
8.	Common collector Amplifier circuit		1 week
9.	Common Base Amplifier Circuits		1 week
10.	Common source Amplifier Circuits		1 week
11.	Operational Amplifier as Inverting and Noninverting Amplifier		1 week
12.	Operational Amplifier as Differentiator and Integrator		1 week
13.	RC phase-shift Oscillator		1 week
14.	SCR as a switch		1 week

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
	30%	التقارير
	20%	الامتحان المتوسط
	50%	الامتحانات النهائية

طرق التدريس: تجارب عملية في المختبر



الكتب و المراجع :

1. Instructional Lab. Sheets
2. Thomas L. Floyd – “ Principles of electric circuits” Electron flow version - prentice hall International – eighth edition 2006.
3. Robert L. Boy listed - Introductory circuit analysis - prentice hall International 1997.
4. Experiments in electronics Fundamentals and electric circuits fundamentals – David Buchla -. prentice hall 2000.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20404211
Course Title	Microprocessors
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Brief Course Description:

Introduction to microprocessors architecture, instruction set, assemblers and assembly language programming, software development, microprocessors applications.

Course Objectives:

To study the microprocessor architecture and relate that knowledge to the design of microprocessor based systems.

1. To learn design techniques for designing memory and I/O for microprocessor based systems.
2. To study the instruction set and applies that knowledge to the design of systems.
3. To study and learn some of the various software development tools available for writing and developing programs.
4. To study and learn some of microprocessors applications



**Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction to microprocessors	<ul style="list-style-type: none"> ▪ Computing and microprocessors ▪ Large and small computers ▪ Comparison of typical computers ▪ Semiconductor technologies ▪ Semiconductor memories 	2 Weeks
2.	Microprocessor architecture	<ul style="list-style-type: none"> ▪ General computer architecture ▪ Registers ▪ Arithmetic unit ▪ Instruction handling area ▪ Stacks ▪ Examples of microprocessor architecture 	3 Weeks
3.	Microprocessor instruction set	<ul style="list-style-type: none"> ▪ Computer instruction formats ▪ Addressing Methods ▪ Types of instructions ▪ Microprocessor instruction sets ▪ Examples of microprocessor instruction sets 	2 Weeks
4.	Microprocessor assembler	<ul style="list-style-type: none"> ▪ Comparison of language levels ▪ Features of assemblers ▪ Features of microprocessor assemblers ▪ Examples of assemblers, Intel 8080 and Motorola 6800 	2 Weeks
5.	Assembly language programming	<ul style="list-style-type: none"> ▪ Simple programs ▪ Loops and arrays ▪ Arithmetic 	2 Weeks
6.	Software development for microprocessors	<ul style="list-style-type: none"> ▪ The tasks of software development 	1 Week
7.	Some Applications of Microprocessors	<ul style="list-style-type: none"> • Test and instrumentations • Communications • Computers • Industrial • Business Equipment • Transportation • Commercial applications 	2 Weeks

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
التاريخ : الاسبوع السادس	%20	الأول
التاريخ : الاسبوع الثاني عشر	%20	الثاني
	%10	أعمال الفصل
التاريخ : الاسبوع السادس عشر	%50	الامتحانات النهائية
		المشروع و الوظائف
		المناقشات و تقييم المحاضرات

طرق التدريس:

1. المحاضرة
2. المناقشة
3. عروض power point

الكتب والمراجع:

1. Introduction to microprocessors software, hardware, programming. Lance A Leventhal





Engineering Program

Specialization	Common
Course Number	20404212
Course Title	Microprocessors Lab.
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

وصف المادة الدراسية:

- ❖ Data transfer, Arithmetic Operations, Looping, Subroutines, General programs, Applications.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. To illustrate classroom topics using a "hands-on" approach to the design, construction, and testing of a microprocessor-based computer and its associated sections - CPU, memory, I/O, interrupts, and programming

الوصف العام:

رقم الوحدة	محتويات الوحدة	اسم الوحدة	الزمن
1.	Introduction to Microprocessor		2 weeks
2.	Data transfer group		
3.	Arithmetic operations		2 weeks
4.	Logic Operation & comparisons		2 weeks
5.	Stack operations		2 weeks
6.	Condition & Unconditional Jumps		2 weeks
7.	Looping		2 weeks
8.	Subroutines		
9.	General Programs		2 weeks
10.	Traffic Light Controller calculations		2 weeks

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
التاريخ : مدة الفصل	%40	التقارير و المشاركة
التاريخ : الاسبوع الثامن	%20	الامتحان المتوسط
التاريخ : الاسبوع السادس عشر	%40	الامتحان النهائي
		المشروع و الوظائف
		المناقشات و تقديم المحاضرات

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



طرق التدريس:

1. المختبر
2. تطبيق التجربة
3. المناقشة
4. عروض power point

الكتب والمراجع:-

1. كراسة مختبر بناء المعالج الدقيق و البرمجة / اعداد : كلية الامير فيصل الفنية
2. Introduction to microprocessors software, hardware, programming. Lance A Leventhal





Program	Engineering
Specialization	Common
Course Number	20307221
Course Title	Programmable Logic Controllers
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



Brief Course Description:

Comparison between relays and programmable controllers ,basic structure of PLC,cycle-scan, CPU,memory,registers,timers and counters addresses , I/O modules, interfacing, programming instructions ,programming devices ,programming procedures, peripheral equipment, troubleshooting and maintenance

Course Objectives:

The objective of this course is to provide the necessary background information which will allow the student to have a good idea about programmable logic controllers .The student will be able to work well with PLCs, write programs. Make electrical wiring and do well with troubleshooting



Detailed Course Description

number	Unite name	Unite content	Time needed
1	PLC architecture	<ul style="list-style-type: none"> ▪ Block diagram of a general purpose PLC ▪ Memory types and the memory map of the PLC ▪ Describe I/O modules ▪ Analysis of I/O modules ▪ Purchasing PLCs 	
2	General PLC Programming procedures	<ul style="list-style-type: none"> ▪ Programming equipment ▪ Programming formats ▪ Process Scanning Considerations 	
3	PLC Programming Languages	<ul style="list-style-type: none"> ▪ Electrical wiring ladder diagrams ▪ Logic ladder diagrams ▪ Ladder diagram rules ▪ Instruction sets ▪ Examples 	
4	Program control instructions	<ul style="list-style-type: none"> ▪ Latching relay instruction ▪ Master control input instruction ▪ Immediate output instruction ▪ One shot instruction ▪ Jump instruction ▪ Other instructions ▪ Examples 	
5	Arithmetic and logic operations and data manipulation	<ul style="list-style-type: none"> ▪ Addition, subtraction, multiplication and division instructions ▪ Increment and decrement instructions ▪ Logic AND, OR, NOR, XOR instructions ▪ Duty cycle generator ▪ Timers instructions 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<ul style="list-style-type: none">▪ Set, reset instruction▪ Move, compare, rotate and shift register instructions Examples	
6	Programming counters	<ul style="list-style-type: none">▪ Programming UP counters▪ Programming Down counters▪ Programming Up-Down counters▪ Programming ring countersExamples	
7	Programming timers	<ul style="list-style-type: none">▪ Programming TON and TOFF timers▪ Programming accumulator timers (TMR)▪ Programming monostable (TMON) and retriggerable monostable timersExamples	
8	Installation, trouble- shooting and maintenance	<ul style="list-style-type: none">▪ Introduction▪ PLC status indicators and alarms▪ Troubleshooting flow charts and tables▪ System troubleshooting techniques.▪ PLC maintenance techniques	

□



□ Evaluation Strategies:

		Percentage	Date
1. Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Assignments	10%	
	Final Exam	50%	--/--/----
2. Homework and Projects			
3. Discussions and lecture Presentations			

□ Teaching Methodology:

1. Lecture

Text Books & References:

Text book:

1. Programmable Logic Controllers, Dr.Mazzoz Sulahat, Eng.Khaled Soboh, Eng Zeid Alhjazeen

References:-

1. Technicians guide to programmable controllers , third edition, Delmar publishers, 1995 Toronto Canada
2. Programmable logic controllers, principles and applications, third edition, Prentice Hall, 1995, U.S.A, John W.Webb, Ronald A.Reis.
3. The PLC workbook, programmable logic controllers made easy, prentice Hall. 1996, U.K, K.Flements –Jewery.W.Jeffcoat



Program	Engineering
Specialization	Common
Course Number	20307222
Course Title	PLCs Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



Brief Course Description:

The lab must support the PLC technology course.

The students should be conducted in small groups; each student must complete the assigned work in the given time

Course Objectives:

At the conclusion of this course the student will be able to:

1. Write the ladder diagrams which is necessary to carry out an automatic process.
2. Write programs in instruction list language which is necessary to carry out an automatic process.
3. Down load the programs to the PLC RAM using hand programmer or PC.
4. Troubleshoot the written programs and do the necessary correction



Detailed Course Description:

Lab number	Lab name	Lab content	Time Needed
1	Realizing a definite number of cycles for two double-acting cylinders		
2	Realizing discrete event-driven sequential control systems by using limit switches or proximity switches		
3	Realizing a discrete time-driven sequential control system		
4	Investigating TON and TOFF timers with practical application		
5	Investigating TRTG and TMON timers with practical applications		
6	Investigating UP and down counters with practical applications		
7	Investigating UP-down and ring counter with practical applications		
8	Application of duty-cycle generators to generate train of pulses		
9	Application of the functions: move, compare, rotate and shift, registers and set-reset function		

□ **Evaluation Strategies:**

		Percentage	Date
1. Exams	Reports	20%	--/--/----
	Midterm Exam	20%	--/--/----
	Assignments	10%	
	Final Exam	50%	--/--/----

□ **Teaching Methodology:**

1. Lab

Text Books & References:

1. ELC-2001 Programmable Controller, Hardware Manual, Carlo Gavazzi Denmark.
2. S7-200 Programmable Controller, Quick Start manual, Siemens 1995

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialty	Common
Course Number	20401111
Course Title	Power Electronics
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



Brief Course Description:

- ❖ Principles and Methods of Electric Power Conversion. Complementary Components and Systems. AC-to-DC Converters. AC-to-AC Converters. DC-to-DC Converters. DC-to-AC Converters. Switching Power Supplies. Power Semiconductor Devices. List of Principal Symbols. Semiconductor Power Switches. Diodes and Phase-Controlled Converters .Cycloconverters. Voltage-Fed Converters. Current-Fed Converters. Choppers. Basic calculations. Waveforms. Applications

Course Objectives:

Upon the completion of the course, the student will be able to:

1. Distinguish power electronics devices.
2. Identify power electronics devices
3. Use power electronics devices.
4. Investigate characteristics of power electronics devices.
5. Test and troubleshoot power electronics devices.
6. Provide basic calculations of power electronics devices.
7. Use energy converters with different loads



Detailed Course Description:

Unit. number	Unite name	Unite content	Time Needed
1.	Power Semiconductor Devices	<ul style="list-style-type: none"> Diodes. Thyristors. Triacs. Gate Turn-Off Thyristors (GTOs). Bipolar Power or Junction Transistors (BPTs or BJTs). Power MOSFETs. Static Induction Transistors (SITs). Insulated Gate Bipolar Transistors (IGBTs). MOS-Controlled Thyristors (MCTs). Integrated Gate-Commutated Thyristors (IGCTs). Power Integrated Circuits (PICs) 	
2.	Diodes and Phase-Controlled Converters	<ul style="list-style-type: none"> Diode Rectifiers. Thyristor Converters. Converter Control 	
3.	Frequency Changers	<ul style="list-style-type: none"> Classification and applications. Block diagrams and principle of operation. Examples: Phase-Controlled Cycloconverters. Matrix Converters. High-Frequency Cycloconverters 	
4.	Voltage-Fed Converters	<ul style="list-style-type: none"> Single-Phase Inverters. Three-Phase Bridge Inverters. Multi-Stepped Inverters. Pulse Width Modulation Techniques. Three-Level Inverters. Hard Switching Effects. Resonant Inverters. Soft-Switched Inverters. PWM Rectifiers 	
5.	Current-Fed Converters	<ul style="list-style-type: none"> General Operation of a Six-Step Thyristor Inverter. Load-Commutated Inverters. Force-Commutated Inverters. Multi-Stepped Inverters. Inverters with Self-Commutated Devices. Current-Fed vs Voltage-Fed Converters 	
6.	Choppers	<ul style="list-style-type: none"> Classification, principle of operation, applications 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	
Discussions and lecture Presentations			

teaching Methodology:

- ❖ Lectures

Text Books & References:

Textbook:

1. M. Rashid, Power Electronics Circuits, Devices and Applications, Upper Saddle River, NJ: Pearson Education, 3^d Edition, 2003.

References :

1. Reddy, Rama S., Fundamentals of Power Electronics, Boca Raton, Fla., CRC Press, 2000.
2. S.B. Dewan and A. Straughter, Power Semiconductor Circuits, John Wiley & Sons, USA, 1994



Engineering Program

Specialty	Common
Course Number	20401112
Course Title	Power Electronics Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



Brief Course Description:

- ❖ Test of semiconductor devices. Investigation of characteristics of power electronics devices. Investigation of rectifier, chopper, and inverter circuits under different loads (R, L-loads)

Course Objectives:

Upon the completion of the course, the student will be able to:

1. Distinguish power electronics devices.
2. Use power electronics devices.
3. Troubleshoot power electronics devices.
4. Control Thyristors and power transistors.
5. Connect the power electronics circuits.
6. Troubleshoot power electronics converters.
7. Provide basic calculations related to the output of power electronics converters



Detailed Course Description:

Unite number	Lab name	Lab content	Time Needed
1.	Identification and troubleshooting of power electronics semiconductor devices		(1 week)
2.	Investigation of characteristics of power electronics devices (Diodes, transistors, Thyristors)		(2 week)
3.	Investigation of firing circuit of Thyristor. (Firing circuit with AC voltage, firing circuit with DC voltage and firing circuit with pulse signals)		(2 weeks)
4.	Investigation of controlled rectifiers characteristics (Single phase and three phase circuits)		(3 weeks)
5.	Investigation of Chopping circuits		(1 week)
6.	Investigation of inverter characteristics. (Single phase and three phase circuits)		(3 weeks)
7.	Investigation of frequency changers characteristics		(2 weeks)

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	
Discussions and lecture Presentations			

Teaching Methodology:

- ❖ Lab. work

Text Books & References:**References :**

Instructional Lab. Sheets

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

صفحة (7) من (7)



Engineering Program

Specialization	Common
Course Number	20304241
Course Title	Protection and Control Devices
Credit Hours	2
Theoretical Hours	0
Practical Hours	2



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

وصف المادة الدراسية:

* The target of the course is to give the student the basic information and skills related to the most common control and protection devices ,The student shall gain the experience of selection and wiring and troubleshooting different control and protection devices such as fuses, circuit breakers , relay ,contactors ,and switches.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Use select & trouble shooting of fuses, relays, C.B.
2. Operate and check different types of relays.
3. Connect & investigate current & voltage transformers.



الوصف العام:

رقم الوحدة	محتويات الوحدة	اسم الوحدة	الزمن
1.	The Philosophy of Protective Relaying	<ul style="list-style-type: none"> ▪ The function of protective relaying. ▪ Electrical sub-station. ▪ Fault calculations. ▪ Protective relaying. ▪ Essential qualities of protection. 	2 weeks
2.	Fuses	<ul style="list-style-type: none"> ▪ The construction & types of low voltage fuses. 	3 weeks
3.	Circuit Controlling Devices	<ul style="list-style-type: none"> ▪ Switches. ▪ Toggle, Push, and rotary switch. ▪ Micro switches, Rheostat. ▪ Time switch, Mercury, Pressure & Thermal switches. 	3 weeks
4.	Relays	<ul style="list-style-type: none"> ▪ Induction relays. ▪ Over current relay. ▪ Over & under voltage relay. ▪ Moving coil relays. ▪ Thermal relays. 	2 weeks
5.	Current Transformer (CT)	<ul style="list-style-type: none"> ▪ Voltage transformer ▪ Liner coupler. ▪ Connection of rectifiers. ▪ Rectifier, Amplifier & Oscillator. 	1 week
6.	Sulphur Hexafluoride (SF₆) Circuit Breaker	<ul style="list-style-type: none"> ▪ Introduction. ▪ Physical properties of SF₆ gas. ▪ Dielectric properties of SF₆ gas. ▪ Arc extension in SF₆ C.B. ▪ Minimum oil C.B. 	2 weeks
7.	Air Break C.B.	<ul style="list-style-type: none"> ▪ Introduction. ▪ Construction of Air-Break C.B. ▪ Arc extension in Air-Break C.B. ▪ Air blast C.B. ▪ Principle of arc quenching in ABCBS 	3 weeks

❖ تطبيق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
	%20	الأول
	%20	الثاني
	%10	أعمال الفصل
	%50	الامتحانات النهائية

طرق التدريس:

❖ يحدد عضو هيئة التدريس الطريقة المستخدمة من خلال (محاضرة، عرض، مناقشات، مختبرات).

الكتب و المراجع :

- Textbook:
 1. Applied protective relaying. USA. Flourida, WH 1982.
- References:
 1. Protective relaying, N.C
 2. Power system protection, second edition, England, 1981.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20304242
Course Title	Protection and Control Devices Lab.
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

وصف المادة الدراسية:

* The course aims at giving the students practical skills in order to select ,wire troubleshoot and maintain the most common control and protection devices like fuses ,circuit breakers , relays ,contactors ,timers ,switches ,and measuring transformers.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Use & select relays, circuit breakers.
2. Contactors and different types used in power supplies & control circuits.
3. Construct and investigate protection and control circuits.



الوصف العام:

رقم الوحدة	محتويات الوحدة	اسم الوحدة	الزمن
1.	The Equipments That Used in Protection and Control Devices	<ul style="list-style-type: none"> ▪ Fuses. ▪ Switches. ▪ Circuit Breakers. ▪ Timers. ▪ Relays. ▪ Power Transformer & Current transformer. 	8 weeks
2.	Star – Delta Control Box	<ul style="list-style-type: none"> ▪ Introduction. ▪ Equipment Required. ▪ Procedure. ▪ Controlling Connection. ▪ Meters & indication lights. ▪ Trouble shooting. 	8 weeks

طرق التقييم المستخدمة :

التاريخ	نسبة الامتحان من العلامة الكلية	الامتحانات
	30%	التقارير
	20%	الامتحان المتوسط
	50%	الامتحانات النهائية

طرق التدريس:

❖ تجارب عملية في المختبر

الكتب و المراجع :

المراجع:

Laboratory Sheets Prepared by Instructor

❖ تطبيق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008