



كلية الهندسة التكنولوجية



جامعة البلقاء التطبيقية

الخط الدراسي لبرنامج الشهادة
الجامعية المتوسطة
تخصص التحكم الكهرورئوي والتحكم
الكهروميديروليكي
2008/2009



بإشرافه عميد الكلية الأستاذ الدكتور قاسم جابر

Curriculum for Associate Degree Program in Electro-pneumatic and Electro-hydraulic Control Specialization

The curriculum of associate degree in “Electro-pneumatic and Electro-hydraulic Control” 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



**The curriculum of associate degree in
Electro-pneumatic and Electro-hydraulic Control Specialization**

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 follow:

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	20301113*
20403111	Electronics	3	3	-	20301113*
20403112	Electronics Laboratory	1	-	3	20403111*
20404121	Digital Fundamentals	2	2	-	20403111
20404122	Digital Fundamentals Laboratory	1	-	3	20404121*
20307211	Control Technology	2	2	-	-
20307212	Control technology Laboratory	1	-	3	20307211*
20304241	Protection and Control Devices	2	2	-	-
20304242	Protection and Control Devices Laboratory	1	-	3	20304241*
20308211	Transducers	3	3	-	20404121
20308212	Transducers Laboratory	1	-	3	20308211*
20207111	Fluids and Hydraulic Machines	3	3	-	21302111*
20207112	Fluids and Hydraulic Machines Laboratory	1	-	3	20207111*
20308221	Pneumatic Logic	3	3	-	20404121
20308222	Pneumatic Logic Laboratory	1	-	3	20308221*
20308223	Pneumatic and Hydraulic Drives	3	3	-	20207111
20308224	Pneumatic and Hydraulic Drives Laboratory	1	-	3	20308223*
20307221	Programmable Logic Controllers	3	3	-	20404121
20307222	Programmable Logic Controllers Laboratory	1	-	3	20307221*
20308291	Training**	3	-	-	-
20308292	Project	3	-	-	-
Total		43	27	33	

* Co-requisite

** Equivalent to 280 training hours



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Study Plan for Associate Degree

in

Electro-pneumatic and Electro-hydraulic Control Specialization

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
20201111	Engineering Workshops	1	20506111	Occupational Safety	2
21301111	General Mathematics	3	20201121	Engineering Materials	2
21302111	General Physics	3	20301113	Electrical Circuits	3
21302112	General Physics Lab.	1	20301114	Electrical circuits Lab.	1
20403111	Electronics	3	21901100	Islamic Culture	3
20403112	Electronics Lab.	1	20404121	Digital Fundamentals	2
Total		18	Total		18

Second Year					
Third Semester			Fourth Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
20307211	Control Technology	2	20308223	Pneumatic and Hydraulic Drives	3
20307212	Control technology Lab.	1	20308224	Pneumatic and Hydraulic Drives Lab.	1
20304241	Protection and Control Devices	2	20308291	Training	3
20304242	Protection and Control devices Lab.	1	20308292	Project	3
20308211	Transducers	3	21702111	Communication Skills and Technical Writing	3
20308212	Transducers Lab.	1	20308222	Pneumatic Logic Lab.	1
20308221	Pneumatic Logic	3	20307221	PLCs	3
20404122	Digital fundamentals Lab.	1	20307222	PLCs Lab.	1
20207111	Fluids and Hydraulic Machines	3			
20207112	Fluids and Hydraulic Machines Lab.	1			
Total		18	Total		18

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

Brief Course Description

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 تحليلاً أدبياً؛ 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.		
Control Technology	20307211	2 (2-0)
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		
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		

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

operation, characteristics. Ratings of protection devices, troubleshooting and calibration. Selection of protection devices.

Protection and Control Devices Lab.	20304242	1 (0-3)
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The course aims at giving the student the 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

Transducers	20308211	3 (3-0)
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The course is intended to give the students the theoretical and technological experience related to different types of transducers used for measurement and control. The course classifies transducers and gives the principles of functioning and application of pressure, displacement, strain, flow temperature and level transducers

Transducers Lab.	20308212	1 (0-3)
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At conclusion of the laboratory course, the student shall be able to select, wire or tube, calibrate and specify a wide range of different industrial transducers. The student will be able to carry out troubleshooting and elementary modification to that range of transducer

Fluids and Hydraulic Machines	20207112	3 (3-0)
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Fluid properties, fluid static's, fluid motion, continuity equation, momentum principle, energy principle, Fluid flow in pipes, pipe friction, introduction to Pumps, Types ,Selection and application of pumps.

Fluids and Hydraulic Machines Lab.	20207113	1 (0-3)
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Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoullis equation, Reynolds experiments, flow through orifices, and nozzle venture friction factor.

Pneumatic Logic	20308221	3 (3-0)
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Introduction to air logic, industrial application and control characteristics. Fundamentals of logic elements. Concepts and components of moving part logic logic (MPL). Signal transmission and communication, symbology, schematics and flow diagrams. Application of pneumatic logic like bottle filling diagrams. Parts sorting system and press control system

Pneumatic Logic Lab.	20308222	1 (0-3)
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The course covers the implementation of different air logic functions (AND, OR, EXOR, Bistable elements) in order to drive single acting and double acting cylinder according to the given control algorithm

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Pneumatic and Hydraulic Drives	20308223	3 (3-0)
The course covers the specifications and application requirements of different components of the drive systems: execution final elements, control valves, timers, limit switches, reed switches and proximity sensors. The students are introduced to pneumatic and hydraulic system components. Basic pneumatic and hydraulic drives are investigated		
Pneumatic and Hydraulic Drives Lab.	20308224	1 (0-3)
The course covers the major activities related to industrial pneumatic and hydraulic drives, such as actuator positioning, speed control, event driven controls, and realizing different sequential operations		
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	20308291	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	20308292	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



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

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

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:

30%	التقارير و المشاركة
20%	الامتحان المتوسط
50%	الامتحان النهائي
	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



Engineering Program

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



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



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	20207111
Course Title	Fluids and Hydraulic Machines
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



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



Brief Course Description:

- ❖ Fluid properties, fluid static's, fluid motion, continuity equation, momentum principle, energy principle, Fluid flow in pipes, pipe friction, introduction to Pumps, Types ,Selection and application of pumps.

Course Objectives:

1. Develop competence in use of conservation laws (mass, energy, momentum) for analysis, design, selection, and operation of flow measuring devices, of open and closed water and waste water conveyance systems, and of hydraulic machines (pumps, turbines).
2. Utilize methods for risk and reliability analysis along with engineering economics in selecting components and systems.
3. Strengthen understanding of phenomena (e.g., cavitation, pressure/flow relations, losses), devices, components and systems with laboratory experiments and field trips.
4. Improve communication skills through report writing.
5. Development of dimensionally consistent equations. Competence with both SI and British Gravitational system of units.
6. Development of mass, momentum, and energy balances.
7. Application of conservation equations for pipe flow, pumping, and simple open channel flow application.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction	<ul style="list-style-type: none"> ▪ Introduction ▪ Units of measurement ▪ Fluid physical properties, Density, specific weight, viscosity, surface tension, compressibility 	
2.	Hydrostatics	<ul style="list-style-type: none"> ▪ Fluid pressure, Pascal's law, Pressure variation in static fluid, pressure head, Gage and absolute pressure ▪ Pressure measurements (barometer, Manometers, Piezometer, Bourdon tube) ▪ Engineering applications of hydrostatics 	
3.	Equilibrium of Floating Bodies	<ul style="list-style-type: none"> ▪ Archimedes principle ▪ Metacenter and metacentric height ▪ Condition of Equilibrium ▪ Oscillation of floating body 	
4.	Fluid Flow Concept	<ul style="list-style-type: none"> ▪ Types of flow, Laminar and turbulent flow, uniform flow, steady and unsteady flow, incompressible and Compressible flow ▪ Fluid energy: internal energy, Kinetic energy, potential energy, pressure energy ▪ Fluid motion equations: Continuity, equation of motion for steady flow, Bernoulli equation and its applications ▪ Flow measurement: Flow through Orifice, venture, flow over notches, Pitot tube, Rota meter, discharge coefficients 	
5.	Flow through pipes	<ul style="list-style-type: none"> ▪ Types of flow in pipes, Reynolds number, boundary layer and flow in pipe, loss head in pipes Darcy-Wies formula of head in pipe, relation between friction coefficient and Reynolds ▪ Friction loss in sudden contraction and expansion ▪ Friction loss in fittings and valves ▪ Velocity distributions in pipe flow ▪ Positive displacement pumps ▪ Gear and screw pumps ▪ Centrifugal pumps 	

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

		<ul style="list-style-type: none"> ▪ Pumps performance and characteristics curves ▪ Power and efficiency calculations 	
6.	Pumps	<ul style="list-style-type: none"> ▪ Types of Pumps, Principle of operation ▪ Pump power and efficiency ▪ Net positive section head ▪ Reciprocating pumps: Construction, reducing flow fluctuations 	
7.	Compressors	<ul style="list-style-type: none"> ▪ Types of Air compressors ▪ Reciprocating compressors ▪ Centrifugal compressors 	

Evaluation Strategies:

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

Teaching Methodology:

1. Lectures
2. Power point presentations
3. Discussion

Text Books & References:

References:

1. Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines by R.S. Khurmi, Publisher: S Chand, New Delhi (May 1987), ISBN: 8121901626.
2. Franzini, Fluid Mechanics with Engineering Applications, 10th Edition, McGraw Hill, 2002.
3. Giles R V et al, "Schaum's Outline of Theory and Problems of Fluid Mechanics and Hydraulics", 3rd Edition, McGraw-Hill, 1994.
4. E John Finnemore and Joseph B Franzini, Fluid Mechanics With Engineering Applications, 10th Edition.

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



Engineering Program

Specialization	Common
Course Number	20207112
Course Title	Fluids and Hydraulic machines Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



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

Brief Course Description:

- ❖ Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoulli's equation, Reynolds experiments, flow through orifices, and nozzle venturi friction factor.

Course Objectives:

At the completion of this course, each student is expected to be able to:

1. Validate Bernoulli's equation.
2. Measure the fluid Density and viscosity.
3. Determine the Force of pressure on immersed plate.
4. Study the Energy loss and friction coefficient.
5. Perform Flow rate measurements (by orifice and venturi).
6. Study the performance of Reciprocating, gear, and centrifugal pumps.
7. Connect pumps in series and parallel and investigate the performance of each configuration.



Detailed Course Description:

Lab Number	Lab Name	Lab Content	Time Needed
1.	Density and viscosity measurements		1
2.	Force of pressure on immersed plate		1
3.	Demonstrating of Bernoulli's equation		1
4.	Flow rate measurements (flow through orifice and venture)		1
5.	Energy loss and friction coefficient measurements		1
6.	Head loss in smooth and rough pipes		1
7.	Pipe flow, Reynolds number, laminar and turbulent flow in pipes		1
8.	Flow over notches and Weirs		1
9.	Pump Testing in Series		1
10.	Reciprocating pump performance		1
11.	Gear pump efficiency		1
12.	Performance of Reciprocation air compressor		1
13.	Centrifugal Pump Testing		1

Evaluation Strategies:

Exams		Percentage	Date
Exams	Mid Exam	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----

Teaching Methodology:

2. Laboratory

Text Books & References:

Instructional Lab. Sheets



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



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 counters Examples	
7	Programming timers	<ul style="list-style-type: none">▪ Programming TON and TOFF timers▪ Programming accumulator timers (TMR)▪ Programming monostable (TMON) and retriggerable monostable timers Examples	
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	Electro-pneumatic and Electro-hydraulic Control
Course Number	20308223
Course Title	Pneumatic and Hydraulic Drives
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



Brief Course Description:

- ❖ Introduction to fluid mechanics. Properties of hydraulics and pneumatics. Structure of pneumatic and hydraulic systems. Components of pneumatic and hydraulic systems: Execution final elements, Control valves, Timers, Limit switches, Reed switches, Proximity sensors. Symbols and schematic standards, numbering system and identification of pneumatic and hydraulic components. Basic pneumatic and hydraulic drives

Course Objectives:

- ❖ The main objective of the course is to provide the necessary background information which will allow the student to build solid understanding of common industrial pneumatic and hydraulic drives. The student will be able to specify, select, install, troubleshoot and run industrial pneumatic and hydraulic drive systems



Detailed Course Description:

Unite number	Unite name	Unite content	Time Needed
1.	Introduction to pneumatic and hydraulic drives, and their basic components. Definition of pneumatic drives, control devices, distribution devices, actuators and transmission mechanisms. Examples		(1 week)
2.	Cylinders: single acting and double acting cylinders. Diaphragm cylinders, impact cylinders, cushioned cylinders, special types of cylinders. Standard cylinder sizes. Specifications of cylinders. Cylinder air consumption. Piston velocity considerations		(1 week)
3.	Pneumatic and hydraulic motors. Vane-type motors, piston-type motors (axial and radial), rotary actuators. Ratings of motors. Factors defining selection criteria of motors		(1 week)
4.	Valves: classification of valves. Reading schematics of valves. Directional control valves. Pressure control valves. Flow control valves. Check valves. Shuttle valves. Double cut-off valves. Quick exhaust valves. Nozzle valves. Flapper valves. Valves applications and structures		(2 weeks)
5.	Timers, proximity sensors and amplifiers. ON-delay timer, OFF-delay timer, one-shot timer. Back-pressure proximity sensors, reflex proximity sensors, air barriers. Pneumatic and hydraulic amplifiers and intensifiers		(2 weeks)
6.	Piping, fittings and accessories. Service units, pressure regulators (reducers), chocks, fittings and connectors, types of connectors. Pipes and hoses		(1 week)
7.	Control of single acting and double acting cylinder. Control of unidirectional and bidirectional motors, influencing rotational speed, influencing torque and force. Stopping of cylinders, and various circuit combinations. Examples		(2 weeks)

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

8.	Solenoid valves. Principle of operation. Electro-pneumatic and electro-hydraulic directional valves. Electro-magnetic relays, connection diagrams. Electrical limit switches		(1 week)
9.	ON-OFF electro-pneumatic and electro-hydraulic drives. Examples on using electromagnetic relays and the control device to control industrial processes. Examples include the pneumatic-hydraulic circuits and the electrical circuits also. Examples on using PLCs to drive power cylinders or motors		(2 weeks)
10.	Introduction to proportional control. Proportional directional control valves. Pressure proportional control valves. Flow proportional control valves. Comparison between ON-OFF drives and proportional drives		(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:

- ❖ Lectures

Text Books & References:

1. Basic pneumatics. Ing. Buro. J.P. Hasebrink. Editor: Mannesmann Roxroth Pneumatik. GmbH. Schlenungdruck GmbH. 1977, Germany.
2. القيادة الكهرومائية والكهروهيدروليكية، د. محمد عالية، م. زيد بولص حجازين، مكتبة المجتمع العربي للنشر والتوزيع، 2005، الأردن

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

صفحة (4) من (7)



Engineering Program

Specialty	Electro-pneumatic and Electro-hydraulic Control
Course Number	20308224
Course Title	Pneumatic and Hydraulic Drives Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



Brief Course Description:

- ❖ The course covers the major activities related to industrial pneumatic and hydraulic drives, such as actuator positioning, speed control, event driven controls and realizing different sequential operations

Course Objectives:

- ❖ The objectives of the course are to provide the student with the practical skills related to managing pneumatic and hydraulic drive systems. The student is supposed to analyze the task, write the control algorithm, assemble the circuit and run it



Detailed Course Description:

Unit number	Lab name	Lab content	Time Needed
1.	Translation of real industrial processes to a programmed sequence of logical operations by using traditional electrical control and by using PLCs, limit switches, counters, timers and PLC registers		(3 weeks)
2.	Realization of pneumatic out-stroking and in-stroking and controlling the drive velocity by using quick-exhaust valves		(1 week)
3.	Realization of pneumatic sequential control of a cylinder motion by using pressure switch and pneumatic timers		(1 week)
4.	Control of the cylinder velocity of a hydraulic system by using check-chock assembly and traditional electrical circuit		(2 weeks)
5.	Operate and carry out the required adjustments of a PLC driven electro-pneumatic testing station		(1 week)
6.	Operate and carry out the required adjustments of a PLC driven electro-pneumatic storage station		(1 week)
7.	Using the PLC and directional control valves and proximity switches in order to realize the required control sequence of motion of a pneumatic manipulator		(1 week)

Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports	30%	--/--/----
	Midterm Exam	20%	--/--/----
	Final Exam	50%	--/--/----

Teaching Methodology:

- ❖ Laboratory

References:

Manuals existing at the laboratory and the laboratory sheets prepared by the instructors

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



Program	Engineering
Specialty	Electro-pneumatic and Electro-hydraulic Control
Course Number	20308222
Course Title	Pneumatic Logic Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



Brief Course Description:

The course covers the implementation of different air logic functions in order drive single acting and double acting cylinders as shown in course detailed outlines

Course Objectives:

The course aims at giving the student the practical skills in order to use the different air logic elements in building and commissioning pneumatic drive systems



Detailed Course Description:

Unite number	Unite name	Unite content	Time Needed
	Single acting cylinder control with	<ul style="list-style-type: none"> ▪ 2 positions, 3 way single stable valves with manual action ▪ Bistable valve 3/2 and limit 	
	Control of double acting cylinder with	<ul style="list-style-type: none"> ▪ - Bistable 4/2 at impulsions ▪ - Bistable 4/2 and limit switch. 	
		<ul style="list-style-type: none"> ▪ Practical investigation of the AND gate and OR gate in accordance with the given pneumatic circuit 	
		<ul style="list-style-type: none"> ▪ Practical investigation of the logic air functions: NOT, YES and inhibition according to the given circuits 	
		<ul style="list-style-type: none"> ▪ Emergency blocking of the piston with block interception devices and not logic cell 	
		<ul style="list-style-type: none"> ▪ Blocking in intermediate position of the piston with block interception devices and OR cell 	
		<ul style="list-style-type: none"> ▪ 2 points simultaneous control of a double-acting cylinder with AND cell ▪ Control of a double-acting cylinder with 1 NOT cell, 1 bistable and 1 limit switch. 	

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		<ul style="list-style-type: none"> Control of a double-acting cylinder with 2 NOT cells 	
		<ul style="list-style-type: none"> Double acting cylinder stroke commutation with storage and OR NOT cells Continuous commutation with storage, NOT, and OR cells Stroke commutation of double-acting cylinder with bistable, 2 AND/YES cells and 2 limits switches 	
		<ul style="list-style-type: none"> Using PLC logic functions to realize sequential processes 	

□ Evaluation Strategies:

		Percentage	Date
1. Exams	Reports	30%	
	Midterm Exam	20%	
	Final Exam	50%	

□ Teaching Methodology:

1. Lab

Text Books & References:

References:

1. Modular pneumatic logic tutor , Didacta, India
2. Lab Sheets prepared by the teacher

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



Program	Engineering
Specialty	Electro-pneumatic and Electro-hydraulic Control
Course Number	20308221
Course Title	Pneumatic Logic
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



Brief Course Description:

Introduction to air logic. Industrial applications and control characteristics. Fundamentals of logic elements. Concepts and components of moving part logic (MPL). Signal transmission and communications, symbology, schematics and flow diagram. Applications of pneumatic logic like bottle filling system, parts sorting system and press control system

Course Objectives:

1. To provide an overview of pneumatic logic elements and industrial pneumatic logic systems. Emphasis will be on the analysis and application of pneumatic logic in industrial projects.
2. After taking the course the student should be able to; describe air logic function elements and their Boolean equations and symbols. Analyze the work of common industrial logic processes. Build and assemble and troubleshoot logic pneumatic industrial control systems



Detailed Course Description:

Unit number	Unite name	Unite content	Time Needed
1.	Introduction to air logic control	<ul style="list-style-type: none"> Industrial applications .control characteristics, moving part logic, and fluidics 	
2.	Fundamentals of logic systems	<ul style="list-style-type: none"> Boolean postulates. Basic operations. Algebraic expressions. Mathematical symbolism. Combining devices. Defined functions 	
3.	MPL concepts and components:	<ul style="list-style-type: none"> Concepts. MPL classes. Typical MPL valve operation 	
4.	Non MPL concepts and components	<ul style="list-style-type: none"> Fluids concepts. Jet deflection destruction. Device packages 	
5.	Logic elements	<ul style="list-style-type: none"> Yes. Not , AND , OR ,NAND , NOR , and XOR, coincidence . inhibitor , timers , flip- flops 	
6.	Signal transmission and communication	<ul style="list-style-type: none"> Pressure attenuation. Time delay phase delay. And pulse energy 	
7.	Simbology, schematics and flow diagrams	<ul style="list-style-type: none"> Standards, symbols, convention, schematics, logic diagram, flow chart, connection diagrams, truth tables and relay logic 	
8.	Applications	<ul style="list-style-type: none"> Press control system Parts storing system. Bottle filling system. Other systems 	

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

□ **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:

1. Air Logic Control for Automated Systems, Rudy G. Wojtecki, P.E, CRC Press.1999 Newyork. ISBN 0-8493-2057-7
2. An introduction to fluid logic, N.M Morris, McGraw Hill Book Company. 1995, U.K



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



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 Hexafloride (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



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



Program	Engineering
Specialty	Common
Course Number	20308211
Course Title	Transducers
Credit Hours	3
Theoretical Hours	3
Practical Hours	0





Brief Course Description:

The course is intended to give the students the theoretical and technological experience related to different types of transducers used for measurements and control. The course classifies transducers and gives the principles of functioning and application of pressure, displacement, strain, flow, temperature and level transducers

Course Objectives:

The course aims at giving the student the necessary theoretical and technological knowledge and skills in order to specify, select, install, wire, and troubleshoot the different types of industrial transducers and proximity sensors



Detailed Course Description:

Unit number	Unite name	Unite content	Time Needed
1.	Classifications of transducers	<ul style="list-style-type: none"> ▪ Active and passive transducers, linear and nonlinear transducers, basic requirements of transducers, applications of transducers in measurements and control 	
2.	Transducers characteristics	<ul style="list-style-type: none"> ▪ Static and dynamic characteristics ▪ First order and second order transducers ▪ Primary and secondary transducers ▪ Examples 	
3.	Elastic pressure transducers	<ul style="list-style-type: none"> ▪ Bourdon tubes ▪ Diaphragms, bellows, application examples 	
4.	Strain transducers	<ul style="list-style-type: none"> ▪ Lateral and axial strain ▪ Static and dynamic strain ▪ Wire strain gauges and semiconductor strain gauges ▪ Effect of temperature on strain gauges performance ▪ 1/4 bridge, 1/2 bridge and complete bridge strain gauges 	
5.	Potentiometric transducers	<ul style="list-style-type: none"> ▪ Types of potentiometric transducers and their applications ▪ Using of operational amplifiers and Whetston bridges for signal conditioning 	
6.	Capacitive transducers	<ul style="list-style-type: none"> ▪ Principle of operation and basic relations ▪ Circuit analysis and applications ▪ Capacitive proximity sensors 	
7.	Piezoelectric transducers	<ul style="list-style-type: none"> ▪ Basic theory and types of piezoelectric transducers 	

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

		<ul style="list-style-type: none"> ▪ Forward and reverse piezoelectric transducers ▪ Piezoelectric strain gauges ▪ Applications of piezoelectric transducers 	
8.	Inductive transducers	<ul style="list-style-type: none"> ▪ Principle of operation and basic relations ▪ Variable inductance transducers ▪ Variable reluctance transducers ▪ Eddy current transducers ▪ Inductive proximity sensors ▪ Applications of inductive transducers for displacement measurement and in tachometry and torque measurements 	
9.	Temperature transducers	<ul style="list-style-type: none"> ▪ Bimetallic temperature sensors, RTDs. Thermocouples and thermopiles ▪ I.C temperature transducers 	
10.	Environmental transducers	<ul style="list-style-type: none"> ▪ Smoke and fire detectors ▪ Sound, infrasound and ultrasound sensors ▪ Humidity sensors 	
11.	Optical transducers	<ul style="list-style-type: none"> ▪ Photo-resistor, photo-diode, photo-transistor and photo-thyristor. Optical proximity sensors. Optical couplers. Optical encoders 	

□ **Evaluation Strategies:**

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

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



□ **Teaching Methodology:**

1. Lecture

Text Books & References:

Text Book:

1. Sensors technology handbook ,Editor-in-chief Jon S.Wifson, Elsevier Inc. 2005 U.K, ISBN 0-7506-7729-5

References:

1. أجهزة الاستشعار و تطبيقاتها : (مجسات،نواقل طاقة، قياسات) ، د.محمد عالية، د.محمد أبو زلطة ، 2004مكتبة المجتمع العربي للنشر-الاردن.
2. Sensors and transducers , Ian Sinclair , Newness, 2001, ISBN 0750649321



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



Program	Engineering
Specialty	Common
Course Number	20308212
Course Title	Transducers Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



Brief Course Description:

At the conclusion of the laboratory course, the student shall be able to select, wire or tube, calibrate and specify a wide range of different transducers used in industrial control Also, the student will be able to carry out troubleshooting, and elementary modifications to that range of transducers

Course Objectives:

1. To gain practical experience in building the conditioning circuits(bridges, resonance circuits, potentiometric circuits, modulators) necessary for proper functioning of different transducers
2. To gain experience in using proximity switches (capacitive, inductive and optical)
3. To gain experience in data acquisition systems



Detailed Course Description:

Lab number	Lab name	Lab content	Time Needed
1	Investigation of LVDT static characteristics		
2	Practical study of bimetallic temperature transducers and RTD transducers		
3	Practical study of the thermocouple transducers		
4	Investigation the properties of 1/4 bridge and 1/2 bridge strain gauges		
5	Practical investigation of the properties of variable area capacitive transducers		
6	Investigation of the characteristics of DC and AC tachogenerators and photo-reflective velocity transducers		
7	Investigation of characteristics of inductive proximity sensors		
8	Investigation of the characteristics of capacitive proximity sensors		
9	Investigation of the characteristics of optical proximity sensors		
10	Different assignments defined by the instructor		

 Evaluation Strategies:

		Percentage	Date
1. Exams	Reports	30%	
	Midterm Exam	20%	
	Final Exam	50%	

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

□ **Teaching Methodology:**

1. Lab

Text Books & References:

1. أجهزة الإستشعار وتطبيقاتها ، (مجسات، نواقل طاقة، قياسات) ، د.محمد عالية، د.محمد أبو زلطة ؛ مكتبة المجتمع العربي للنشر – الأردن-2004
2. Sensors and Transducers, Ian Sinclair, Newness ,2001 ; ISBN 0750649321

