



كلية الهندسة التكنولوجية



جامعة البلقاء التطبيقية

الخطط الدراسية لبرنامج الشهادة  
الجامعية المتوسطة  
تخصص الأجهزة الدقيقة والتحكم في العمليات

2008/2009



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## Curriculum for Associate Degree Program in Instrumentation and Process Control Specialization

The curriculum of associate degree program in “Instrumentation and Process Control” 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 curriculum of associate degree in Instrumentation and Process 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	
<b>Total</b>		<b>12</b>	<b>10</b>	<b>4</b>	

**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	-	-
<b>Total</b>		<b>17</b>	<b>10</b>	<b>18</b>	

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**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 Lab	1	-	3	20403111*
20404121	Digital Fundamentals	2	2	-	20403111
20404122	Digital Fundamentals Laboratory	1	-	3	20404121*
20304241	Protection and Control Devices	2	2	-	-
20304244	Protection and Control Devices Laboratory	1	-	3	20304241*
20306111	Pressure and Level Measurements	3	3	-	-
20306112	Pressure and Level Measurements Lab	1	-	3	20306111*
20306221	Flow and Temperature Measurements	3	3	-	-
20306222	Flow and Temperature Measurements Lab	1	-	3	20306221*
20306231	Signal Conditioning and Processing	2	2	-	20404121
20306232	Signal Conditioning and Processing Lab	1	-	3	20306231*
20306241	Process Control	3	3	-	20306111*+ 20306221*
20306242	Process Control Lab	1	-	3	20306241
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*
20306291	Training**	3	-	-	-
20306292	Project	3	-	-	-
<b>Total</b>		<b>43</b>	<b>27</b>	<b>30</b>	<b>-</b>

\* Co-requisite

\*\* Equivalent to 280 training hours

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**Study Plan for Associate Degree  
in  
Instrumentation and Process Control**

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
		1			
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
21901100	Islamic Culture	3	20403111	Electronics	3
20506111	Occupational Safety	2	20403112	Electronics Lab.	1
			21702111	Communication Skills and Technical Writing	3
<b>Total</b>		<b>18</b>	<b>Total</b>		<b>18</b>

Second Year					
Third Semester			Fourth Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
20304241	Protection and Control Devices	2	20306241	Process Control	3
20304242	Protection and Control Devices Lab.	1	20306242	Process Control Lab.	1
20404121	Digital Fundamentals	2	20308291	Training	3
20404122	Digital fundamentals Lab.	1	20308292	Project	3
20306111	Pressure and Level Measurements	3	20306221	Flow and Temperature Measurements	3
20306112	Pressure and Level Measurements Lab.	1	20306222	Flow and Temperature Measurements Lab.	1
20306231	Signal Conditioning and Processing	2	20404211	Microprocessors	3
20201111	Engineering Workshops	1	20404212	Microprocessors Lab.	1
20306232	Signal Conditioning and Processing Lab.	1			
20307221	PLCs	3			
20307222	PLCs Lab.	1			
<b>Total</b>		<b>18</b>	<b>Total</b>		<b>18</b>

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## Brief Course Description

## University Requirements

Course Title	Course No	Credit Hours ( Theoretical /Practical)
<b>Arabic Language</b>	<b>22001101</b>	<b>3 (3-0)</b>
<p>تتضمن هذه المادة مجموعة من المهارات اللغوية بمستوياتها وأنظمتها المختلفة: الصوتية، والصرفية، والنحوية، والبلاغية، والمعجمية، والتعبيرية، وتشتمل نماذج من النصوص المشرقة: قرآنية، وشعرية، وقصصية، من بينها نماذج من الأدب الأردني؛ يتوخى من قراءتها وتدوقها وتحليلها تحليلاً أدبياً؛ تنمية الذوق الجمالي لدى الطلاب الدارسين.</p>		
<b>English Language</b>	<b>22002101</b>	<b>3 (3-0)</b>
<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>		
<b>Islamic Culture</b>	<b>21901100</b>	<b>3 (3-0)</b>
<ol style="list-style-type: none"> <li>1. تعريف الثقافة الإسلامية وبيان معانيها وموضوعاتها والنظم المتعلقة بها - وظائفها وأهدافها.</li> <li>2. مصادر ومقومات الثقافة الإسلامية والأركان والأسس التي تقوم عليها.</li> <li>3. خصائص الثقافة الإسلامية.</li> <li>4. الإسلام والعلم، والعلاقة بين العلم والإيمان</li> <li>5. التحديات التي تواجه الثقافة الإسلامية.</li> <li>6. رد الشبهات التي تثار حول الإسلام.</li> <li>7. الأخلاق الإسلامية والآداب الشرعية في إطار الثقافة الإسلامية.</li> <li>8. النظم الإسلامية.</li> </ol>		
<b>Computer Skills</b>	<b>21702101</b>	<b>3 (1-4)</b>
<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**

<b>Engineering Workshops</b>	<b>20201111</b>	<b>1 (0-3)</b>
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.		
<b>AutoCAD</b>	<b>20204111</b>	<b>2 (0-6)</b>
Introduction to AutoCAD, application of AutoCAD, commands, geometric entities. Geometric construction. Dimensioning, free –hand sketching, object representation, orthographic drawing and projections.		
<b>Occupational safety</b>	<b>20506111</b>	<b>2 (2-0)</b>
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.		
<b>Communication Skills and Technical Writing</b>	<b>21702111</b>	<b>3 (2-2)</b>
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.		
<b>Engineering Materials</b>	<b>20201121</b>	<b>2 (2-0)</b>
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.		
<b>General Mathematics</b>	<b>21301111</b>	<b>3 (2-2)</b>
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)		
<b>General Physics</b>	<b>21302111</b>	<b>3 (2-2)</b>
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.		
<b>General Physics lab</b>	<b>21302112</b>	<b>1 (0-3)</b>
In this course, the student performs thirteen experiments in mechanics and in electricity.		

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**Specialization Requirements**

<b>Electrical Circuits</b>	<b>20301113</b>	<b>3 (3-0)</b>
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.		
<b>Electrical Circuits Lab.</b>	<b>20301114</b>	<b>1 (1-3)</b>
DC and AC circuits. Resonance. Measuring devices.		
<b>Electronics</b>	<b>20403111</b>	<b>3 (3-0)</b>
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.		
<b>Electronics Lab.</b>	<b>20403112</b>	<b>3 (0-3)</b>
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).		
<b>Digital Fundamentals</b>	<b>20404121</b>	<b>2 (2-0)</b>
Numerical systems, operations, and codes, logic gates, Boolean algebra and logic simplification, combinational logic and function of combinational logic, flip – flops, counters, shift registers. Fixed – function Integrated Circuits, and Programmable Logic Devices ( PLDs ).		
<b>Digital Fundamentals Lab.</b>	<b>20404122</b>	<b>1 (0-3)</b>
Experiments in digital fundamentals have to cover logic gates, combinational logic, flip – flops, counters, shift registers.		
<b>Protection and Control devices</b>	<b>20304241</b>	<b>2 (2-0)</b>
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.		
<b>Protection and Control devices Lab.</b>	<b>20304242</b>	<b>1 (0-3)</b>
The course aims at giving the student practical skills in order to select, wire, troubleshoot and maintain the most common control and protection devices like fuses, circuit breakers relays, contactors, timers and switches .		
<b>Pressure and Level Measurements</b>	<b>20306111</b>	<b>3 (3-0)</b>
The course shall cover the different methods to measure the pressure of gasses, liquids and solid materials. Different level measurement methods shall be also treated. Calibration and installation of pressure and level instruments is also to be covered.		

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<b>Pressure and Level Measurements Lab.</b>	<b>20306112</b>	<b>1 (0-3)</b>
The student shall carry out the required experiments demonstrating different methods of level and pressure measurement by using capacitive and resistive transducers. LVDT is used also for level and a pressure measurement, calibration of pressure gauges by using dead weight tester is practiced.		
<b>Flow and Temperature Measurements</b>	<b>20306221</b>	<b>3 (3-0)</b>
Study of differential pressure and variable area method flow meter. Different types of flow meters. Basic concepts of temperature scales units, measuring methods and devices like TC, RTD, Bimetallic, thermocouple, semiconductor and filled system thermometers.		
<b>Flow and Temperature Measurements Lab.</b>	<b>20306222</b>	<b>1 (0-3)</b>
The practical activity includes the study of different methods to measure flow and temperature such as RTD, Thermocouple, Thermistor, Rotameters, Vinturi tubes, Orifice plates and optical sensing propeller flow meter.		
<b>Signal Conditioning and Processing</b>	<b>20306231</b>	<b>2 (2-0)</b>
The course covers important issues related to noise and guarding techniques, filtering, signal conversion amplification, modulation. Signal detection and data acquisition and transmission.		
<b>Signal Conditioning and Processing Lab.</b>	<b>20306232</b>	<b>1 (1-3)</b>
The course covers the following topics: signal amplification, filtering, modulation and demodulation, conversion and detection and data acquisition.		
<b>Process Control</b>	<b>20306241</b>	<b>3 (3-0)</b>
Introduction to process control, studying transfer functions for basic elements P, I and D setting controls. Modes of automated process control on- off, P, PI and PID setting controls, Realizing the different control modes using operational amplifiers, open-loop control using PLC and computers and reading schematics of processes by using ISA.		
<b>Process Control Lab.</b>	<b>20306242</b>	<b>1 (0-3)</b>
Laboratory activates include the level, flow, temperature and pressure controls using Pneumatic and electrical control systems. The students shall do the necessary settings for the on-off, P, PI and PID controllers. Open-Loop controls are investigated using operational amplifiers. Conversion from P/me and me/P shall also be investigated.		
<b>Microprocessors</b>	<b>2040421</b>	<b>3 (3-0)</b>
Introduction to microprocessors architecture, instruction set, assemblers and assembly language programming, software development, microprocessors applications.		

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<b>Microprocessors Lab.</b>	<b>20404212</b>	<b>1 (0-3)</b>
Data transfer, Arithmetic Operations, Looping, Subroutines, General programs, Applications.		
<b>Programmable Logic Controllers</b>	<b>20307221</b>	<b>3 (3-0)</b>
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		
<b>Programmable Logic Controllers Lab.</b>	<b>20307222</b>	<b>1 (1-3)</b>
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		
<b>Training</b>	<b>20306291</b>	<b>3 (280 training hours)</b>
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.		
<b>Project</b>	<b>20306292</b>	<b>3</b>
An integrated assembly/design practical work related to the major fields of study.		





# Engineering Program

<b>Specialization</b>	<b>Common</b>
<b>Course Number</b>	<b>20404121</b>
<b>Course Title</b>	<b>Digital Fundamentals</b>
<b>Credit Hours</b>	<b>2</b>
<b>Theoretical Hours</b>	<b>2</b>
<b>Practical Hours</b>	<b>0</b>



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

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

	%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

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



❖ 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

<b>Specialization</b>	<b>Common Course</b>
<b>Course Number</b>	20301113
<b>Course Title</b>	Electrical Circuits
<b>Credit Hours</b>	3
<b>Theoretical Hours</b>	3
<b>Practical Hours</b>	0



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

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

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



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

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

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



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	20304244
Course Title	Electrical Protection Systems Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



□ **Brief Course Description:**

This Course covers experiments on; fuses , circuit breakers, relays; operation and application of ; electromagnetic relays , electronic relays, differential relays, timers; mechanical ,thermal mercury and electronic timers, contactors.

□ **Course Objectives:**

The student should be able to ;

1. Describe the construction, operation & connection of different types of relays.
2. Describe the construction, operation & connection of circuit breakers & fuses.
3. Describe the construction, operation & connection of timers and contactors.
4. Determine the characteristics of all protection & control devices.
5. Know the requirement of protection systems.



Detailed Course Description:

Lab Number	Unit Name	Unit Content	Time Needed
1.		Experiments of single & three-phase current transformers	
2.		Experiments of summation current transformer	
3		Experiments of single & three – phase voltage transformers	
4		Experiment of electromagnetic overcurrent relay	
5		Experiment of over-voltage & under-voltage relays	
6		Experiment of earth fault relay.	
7		Experiment of directional power relay	
8		Experiment of differential relay	
9		Experiment of circuit breakers	
10		Experiment of fuses	
11		Experiment of uninterruptible supplies	
12		Experiment of timers & contactors	

 Evaluation Strategies:

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

 Teaching Methodology:

 Textbook:

1. Manuals of each type of relays, circuit breakers, timers & contactors.
2. Manuals of current & voltage transformers.





# Engineering Program

<b>Specialization</b>	<b>Common</b>
<b>Course Number</b>	<b>20403111</b>
<b>Course Title</b>	<b>Electronics</b>
<b>Credit Hours</b>	<b>3</b>
<b>Theoretical Hours</b>	<b>3</b>
<b>Practical Hours</b>	<b>0</b>



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

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

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

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

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

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



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"> <li>▪ Forward and reverse biasing.</li> <li>▪ Characteristic curve.</li> <li>▪ Data sheet.</li> </ul>	2 weeks
2.	The zener Diode.	<ul style="list-style-type: none"> <li>▪ Breakdown voltage.</li> <li>▪ Regulation.</li> <li>▪ Characteristic curve.</li> <li>▪ Data sheet</li> </ul>	2 weeks
3.	Rectification Circuits with Filter and Regulator	<ul style="list-style-type: none"> <li>▪ Half- wave and full- wave.</li> <li>▪ Ripple factor.</li> <li>▪ Line and load regulation</li> </ul>	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

Specialty	Instrumentation and Process Control
Course Number	20306221
Course Title	Flow and Temperature Measurements
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



**Brief Course Description:**

- ❖ The course includes the study of differential pressure and variable area method flow meter. Different types of flow meters. Basic concepts of temperature scales units, measuring methods and devices like TC, RTD, Bimetallic, thermocouple, semiconductor and filled system thermometers.

**Course Objectives:**

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

1. Select the most appropriate flow meter for the given task.
2. Connect and commission the selected flow meter.
3. Troubleshoot and maintain the flow meter.
4. Carry out the required simple calculations.
5. Identify different temperature scales and carry out the necessary conversion between them.
6. Distinguish between the different temperature measurement principles and different temperature measurement equipment.



**Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.	<b>Basic theory of flow</b>	<ul style="list-style-type: none"> <li>▪ Basic units and definitions</li> <li>▪ Flow rate equation for incompressible fluids</li> <li>▪ Flow rate equation for compressible fluids</li> <li>▪ Applications of Bernoulli equation</li> <li>▪ Classification of flow measurement methods</li> </ul>	
2.	<b>Differential pressure methods of flow measurement</b>	<ul style="list-style-type: none"> <li>▪ Practical hints for the measurement of fluid flow rate by differential pressure flow meters</li> <li>▪ Flow measurement by differential pressure device installed outside the pipeline</li> <li>▪ Flow measurement for dirt-laden fluids</li> </ul>	
3.	<b>Variable area flow meters</b>	<ul style="list-style-type: none"> <li>▪ General</li> <li>▪ Basic theory of the ratemeters</li> <li>▪ Construction of the ratemeters and their applications</li> </ul>	
4.	<b>Volume flowmeters Magnetic flow meters</b>	<ul style="list-style-type: none"> <li>▪ Rotary meters for liquids</li> <li>▪ Rotary rate meters for liquids</li> <li>▪ Magnetic flow meters</li> </ul>	
5.	<b>Anemometers and anubars</b>	<ul style="list-style-type: none"> <li>▪ Introduction</li> <li>▪ Mechanical anemometers.</li> <li>▪ Hot wire and hot-film anemometers</li> <li>▪ Anubars</li> </ul>	

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

6.	<b>Thermometry</b>	<ul style="list-style-type: none"> <li>▪ Introduction</li> <li>▪ Temperature and temperature scales</li> <li>▪ Practical temperature scales</li> <li>▪ Classification of temperature measurement methods contacts methods, non contact methods, electrical and non-electrical methods, and radiation methods</li> </ul>	
7.		<ul style="list-style-type: none"> <li>▪ Liquid-in-glass and filled-system thermometers. Liquid in glass thermometers. Liquids used in thermometers. Laboratory and industrial thermometers. Thermometers that include an electrical contact. Filled system thermometers. Gas filled and vapour filled thermometers. Correction for changes in bulb volume</li> </ul>	
8.		<ul style="list-style-type: none"> <li>▪ Solid-expansion and bimetal thermometers – solid-expansion thermometers. The coefficient of linear expansion of the solid materials. Bimetallic thermometers in control system. Bimetallic thermostats</li> </ul>	
9.	<b>Resistance and semiconductor thermometers</b>	<ul style="list-style-type: none"> <li>▪ Introduction. Platinum and copper resistance thermometers</li> <li>▪ Semiconductor resistance thermometers</li> <li>▪ Thermister, its characteristics, and its applications in temperature measurement and</li> </ul>	

		control	
10.	Thermoelectric thermometry	<ul style="list-style-type: none"> <li>▪ Electrical circuit for detection temperature</li> <li>▪ Connection of a measuring instrument in a thermocouple circuit</li> <li>▪ Basic Principle of thermocouple (peltier, seebic and Thomson effects)</li> <li>▪ Intermediate metals and compensating leads</li> <li>▪ Intermediate temperature</li> <li>▪ Measuring of the differential temperature using thermocouples</li> <li>▪ Measurement of the average temperature using the thermocouple</li> </ul>	
11.	Pyrometry	<ul style="list-style-type: none"> <li>▪ Principles of radiation</li> <li>▪ The optical pyrometers</li> <li>▪ The infrared pyrometers</li> <li>▪ Photon detector temperature instruments</li> </ul>	

#### 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

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



**Text Books & References:**

1. Instrumentation for Engineering Measurement, James W. Dally, William F. Riley, Kenneth Gmacnnell, 2nd edition John willy and sons. Inc 1993.
2. Measurements and Instrumentation in Heat Engineering Volume. Mir. Publishers. Moscow 1980.
3. Fundamentals of Temperature, Pressure and Flow measurements by Rebert, p. Ben dict, Jul 1984, amazon.com sealer.





# Program Engineering

Specialty	Instrumentation and Process Control
Course Number	20306222
Course Title	Flow and Temperature Measurements Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3







**Brief Course Description:**

- ❖ The practical activity includes the study of different methods to measure flow and temperature such as RTD, Thermocouple, Thermistor, Rotameters, Vinturi tubes, Orifice plates and optical sensing propeller flow meter.

**Course Objectives:**

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

1. Troubleshoot flow meters and carry out the necessary repair or maintenance.
2. Carry out the necessary calibration using the available standard flow meters.
3. Troubleshoot temperature measurement and temperature control circuits and devices.
4. Carry out the required calibrations of the measuring devices.



**Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.	Flow rate through the vinturi tubes	<ul style="list-style-type: none"> <li>The student shall assemble the network with the necessary measuring equipment to measure the defferented pressure and the recovery ratio of the pressure</li> </ul>	
2.	Flow rate through the orifice plates	<ul style="list-style-type: none"> <li>The student shall fix the different types of orifice plates and realize the differential pressure up stream and down stream</li> </ul>	
3.	Optical Sensing Propeller flow meter	<ul style="list-style-type: none"> <li>An impeller placed in the flow stream will be rotated with a velocity proportional to the flow rate. Using optical transducer the impeller shall be calibrated directly for flow rate</li> </ul>	
4.	Rotameters	<ul style="list-style-type: none"> <li>Study the construction of different rotometers. Connect the Rotameter in a pipe network. Carry the necessary check and cleaning for the Rotameter needle valve</li> </ul>	
5.	Capillary bulb Thermostatic Controller	<ul style="list-style-type: none"> <li>The experiment illustrates the use of capillary bulb thermostat to control temperature</li> </ul>	
6.		<ul style="list-style-type: none"> <li>Adjustable bi-metallic strip thermostatic controller with anticipatory</li> </ul>	
7.	Thermocouple	<ul style="list-style-type: none"> <li>A practical study of the principles of thermocouples and practical study of a two-metal</li> </ul>	

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		junction as a temperature indicator	
8.	<b>Thermistor</b>	<ul style="list-style-type: none"> <li>The experiment includes the study of the behavior of negative temperature coefficient resistor and its application in the design of practical measurement systems</li> </ul>	
9.	<b>The RTDs</b>	<ul style="list-style-type: none"> <li>The experiment includes the practical study of the behaviour of a positive temperature coefficient resistance as a temperature measuring device</li> </ul>	
10.	<b>On-off Temperature Control (Hall-Effect).</b>	<ul style="list-style-type: none"> <li>The experiment illustrates the use of hall-effect thermostatic type in the control of temperature</li> </ul>	

**Evaluation Strategies:**

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

**Teaching Methodology:**

- ❖ Laboratory

**Text Books & References:**

1. Systems Laboratory manuals of experiments, JJ instruments SL 40, SL 20. England
2. Teknikit technology tutor, Feed back instruments Kit 3.



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# Engineering Program

<b>Specialization</b>	<b>Common</b>
<b>Course Number</b>	<b>20404211</b>
<b>Course Title</b>	<b>Microprocessors</b>
<b>Credit Hours</b>	<b>3</b>
<b>Theoretical Hours</b>	<b>3</b>
<b>Practical Hours</b>	<b>0</b>



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

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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

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



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## 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





<b>Program</b>	Engineering
<b>Specialization</b>	Common
<b>Course Number</b>	20307221
<b>Course Title</b>	Programmable Logic Controllers
<b>Credit Hours</b>	3
<b>Theoretical Hours</b>	3
<b>Practical Hours</b>	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"> <li>▪ Block diagram of a general purpose PLC</li> <li>▪ Memory types and the memory map of the PLC</li> <li>▪ Describe I/O modules</li> <li>▪ Analysis of I/O modules</li> <li>▪ Purchasing PLCs</li> </ul>	
2	General PLC Programming procedures	<ul style="list-style-type: none"> <li>▪ Programming equipment</li> <li>▪ Programming formats</li> <li>▪ Process Scanning Considerations</li> </ul>	
3	PLC Programming Languages	<ul style="list-style-type: none"> <li>▪ Electrical wiring ladder diagrams</li> <li>▪ Logic ladder diagrams</li> <li>▪ Ladder diagram rules</li> <li>▪ Instruction sets</li> <li>▪ Examples</li> </ul>	
4	Program control instructions	<ul style="list-style-type: none"> <li>▪ Latching relay instruction</li> <li>▪ Master control input instruction</li> <li>▪ Immediate output instruction</li> <li>▪ One shot instruction</li> <li>▪ Jump instruction</li> <li>▪ Other instructions</li> <li>▪ Examples</li> </ul>	
5	Arithmetic and logic operations and data manipulation	<ul style="list-style-type: none"> <li>▪ Addition, subtraction, multiplication and division instructions</li> <li>▪ Increment and decrement instructions</li> <li>▪ Logic AND, OR, NOR, XOR instructions</li> <li>▪ Duty cycle generator</li> <li>▪ Timers instructions</li> </ul>	

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

□



□ **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



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





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### **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

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# Engineering Program

Specialty	Instrumentation and Process Control
Course Number	20306111
Course Title	Pressure and Level Measurements
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



**Brief Course Description:**

- ❖ The course shall cover the different methods to measure the pressure of gasses, liquids and solid materials. Different level measurement methods shall be also treated. Calibration and installation of pressure and level instruments is also to be covered.

**Course Objectives:**

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

1. Calibrate pressure gauge using dead weight tester or standard pressure gauge.
2. Carry out the necessary repair and parts replacement of the different manometers and barometers.
3. Troubleshoot pressure-measuring instruments that incorporate resistive transducers, piezoelectric transducers and capacitive transducers.
4. Troubleshoot level measuring devices that incorporate potentiometric transducers, and capacitive transducers.



**Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.	Principles of pressure in liquids and gas pressure	<ul style="list-style-type: none"> <li>Units of pressure, factors affecting liquid pressure, gauge pressure and absolute pressure, Gas pressure and Volume gas pressure and temperature. Atmospheric pressure, manometers and barometers</li> </ul>	
2.	Low pressure measurements	<ul style="list-style-type: none"> <li>Vacuum, units of low pressure, pirani gauge, thermal conductivity gauge, mcLeod gauge, ionization gauge and stack diaphragm gauge</li> </ul>	
3.		<ul style="list-style-type: none"> <li>Force, stress and strain measurements, force Units, static force strain gauges measurements system for strain strain gauge, <math>\frac{1}{2}</math> and <math>\frac{1}{4}</math> and complete bridge used for strain measurement. Weight and mass beam type and ring type load cells</li> </ul>	
4.	Principle of level measurements	<ul style="list-style-type: none"> <li>Measuring liquid level</li> <li>Storage tank gauges</li> <li>Sight glasses</li> <li>Magnetic gauges</li> <li>Buoyancy and displacer gauges</li> <li>Level switches in high level tanks</li> <li>Photo electric level detectors</li> <li>Magnetic reed switches</li> </ul>	
5.	Measurement of level using pressure head	<ul style="list-style-type: none"> <li>Hydrostatic pressure, pressure head</li> </ul>	

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	<b>instruments</b>	<ul style="list-style-type: none"> <li>▪ Pressure head instrument</li> <li>▪ Air purge measurement</li> <li>▪ Liquid purge systems for level measurement</li> <li>▪ Force balance diaphragm systems for level measurements</li> </ul>	
6.	<b>Electrical methods for level measurement</b>	<ul style="list-style-type: none"> <li>▪ Conductivity and liquid level</li> <li>▪ Level measurement using capacitive transducers. Capacitance probes</li> <li>▪ Capacitance probe electronics.</li> <li>▪ Sonic level measurement</li> <li>▪ Radiation level detection and measurement</li> <li>▪ Potentiometric method for level measurement</li> </ul>	
7.	<b>Solid level measurement</b>	<ul style="list-style-type: none"> <li>▪ Sonic and microwave solid level measurement</li> <li>▪ Using capacitance probes to measure solid level</li> <li>▪ Using weight to determine level</li> <li>▪ Using strain gauge to detect level</li> </ul>	

**Evaluation Strategies:**

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

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**Teaching Methodology:**

- ❖ Lectures

**Text Books & References:**

1. Instrumentation, Franklyn W. Kirk; Nicholas R. Rimboi; American Technical publishers; Inc Third edition, Illinois, USA.
2. Instrumentation and process measurements W. Balton, Longman scientific and technical, 1991 U. K.
3. Measurements and Instrumentation in heat engineering. V. Preobrazhensky, Volume No (2): Mir publishers, 1978, Moscow, USSR.
4. Instrument technology. E. B. Jones, Newnes-Buttererworths; Volume 1, 1974. U. K.
5. Basic instrumentation, Industrial measurement. Patrick J. O'higgins; McGraw-Hill Book Corporation.
6. Mechanical and industrial measurement. R. K Jain; Khanna publishers; Delhi.





# Program Engineering

Specialty	Instrumentation and Process Control
Course Number	20306112
Course Title	Pressure and Level Measurement Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3





**Brief Course Description:**

- ❖ The student shall carry out the required experiments demonstrating different methods of level and pressure measurement by using capacitive and resistive transducers. LVDT is used also for level and a pressure measurement, calibration of pressure gauges by using dead weight tester is practiced.

**Course Objectives:**

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

1. Practical calibrate the pressure gauges.
2. Practical investigate the different methods for pressure and level measurements.





## Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.		<ul style="list-style-type: none"> <li>Using of U-type shaped manometers with open and closed limbs for pressure and differential pressure measurements</li> </ul>	
2.		<ul style="list-style-type: none"> <li>Measurement of low pressures and their amplification, by using inclined manometers with a storage bulb</li> </ul>	
3.		<ul style="list-style-type: none"> <li>Calibration of pressure gauges by using dead-weight tester</li> </ul>	
4.		<ul style="list-style-type: none"> <li>Measurement of liquid level in closed tanks by using pressure gauges</li> </ul>	
5.		<ul style="list-style-type: none"> <li>Measurement of pressure by using capacitive sensors</li> </ul>	
6.		<ul style="list-style-type: none"> <li>Measurement of pressure by using variable resistance</li> </ul>	
7.		<ul style="list-style-type: none"> <li>Measurement of pressure by using LVDT</li> </ul>	
8.		<ul style="list-style-type: none"> <li>Measurement of level by using capacitive transducer</li> </ul>	
9.		<ul style="list-style-type: none"> <li>Measurement of liquid level by using variable resistance</li> </ul>	
10.		<ul style="list-style-type: none"> <li>Measurement of liquid level by using LVDT</li> </ul>	

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**Evaluation Strategies:**

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

**Teaching Methodology:**

- ❖ Laboratory

**Text Books & References:**

1. Systems laboratory manuals, TQ instruments, SL10, SL30, SL60. England.
2. Teknikit technology tutor, Feed back instruments limited Kit3 transducers. England.





# Engineering Program

Specialty	Instrumentation and Process Control
Course Number	20306241
Course Title	Process Control
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



### **Brief Course Description:**

- ❖ Introduction to process control, studying transfer functions for basic elements P, I and D setting controls. Modes of automated process control on- off, P, PI and PID setting controls, Realizing the different control modes using operational amplifiers, open-loop control using PLC and computers and reading schematics of processes by using ISA.

### **Course Objectives:**

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

1. Identify the functions of the various components of the automatic process control system.
2. Recognize the open and closed Loop systems and their application in process control.
3. Carry out the necessary calculations to guarantee system stability and accepted system performance.
4. Realize PID modes of control using the necessary analogue electronic equipment.
5. Carry out controller tuning using the recommended methods.
6. Assemble and test simple automatic process control system.
7. Write simple programs to control processes using PLC.



## Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction to process control	<ul style="list-style-type: none"> <li>Historical background. Application of process control in industry. Advantages of automatic process control. Main components of process control system. Block diagrams. Open-Loop and closed-Loop system. Classification of process control systems in accordance with the nature of power or the nature of control signals</li> </ul>	
2.		<ul style="list-style-type: none"> <li>Transfer functions of the proportional element, integral element differential element, first order element, and second order element</li> </ul>	
3.	Block Diagrams	<ul style="list-style-type: none"> <li>Transfer function of series dynamic elements, loops with negative and loops with positive feed backs. Simplification of block diagrams. Transfer function of open-loop and closed-loop systems</li> </ul>	
4.	Stability of automatic Process Control Systems	<ul style="list-style-type: none"> <li>The characteristic equation of the closed-loop system.</li> <li>Introduction to systems stability. Algebraic criteria of stability. The frequency response and bode diagrams</li> </ul>	
5.	Analogue Controllers	<ul style="list-style-type: none"> <li>Introduction and general features. Proportional control mode. (PI) control mode. (PID) control mode. Electronic controllers. Pneumatic controllers</li> </ul>	
6.	Controller Tuning	<ul style="list-style-type: none"> <li>Open-loop transient response method. Ziegler-Nichols method. Frequency response method</li> </ul>	
7.	Schematic reading of processes by using ISA		

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**Evaluation Strategies:**

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and Projects		10%	

**Teaching Methodology:**

- ❖ Lectures

**Text Books & References:**

1. Process control instrumentation technology, Curtis D. Johnson, Fifth edition Printice-Hall international, Inc.1997, USA.
2. Introduction to control system technology, Fourth edition. Robert N. bateson, 1993 U.S.A, Macmillan publishing company.



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# Program Engineering

Specialty	Instrumentation and Process Control
Course Number	20306242
Course Title	Process Control Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3





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**Brief Course Description:**

- ❖ Laboratory activities include the level, flow, temperature and pressure controls using Pneumatic and electrical control systems. The students shall do the necessary settings for the on-off; P, PI and PID controllers. Open-Loop controls are investigated using operational amplifiers. Conversion from P/I and I/P shall also be investigated.

**Course Objectives:**

The course objective is to give the students practical skills to investigate the properties of manual self-regulated, proportional, proportional integral, PD and PID in process control.



**Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.		<ul style="list-style-type: none"> <li>Investigation of the properties of manual and self-regulated processes</li> </ul>	
2.		<ul style="list-style-type: none"> <li>Investigation of proportional element by software EWB</li> </ul>	
3.		<ul style="list-style-type: none"> <li>Investigation of (D,I) element by software EWB</li> </ul>	
4.		<ul style="list-style-type: none"> <li>Investigation of first order system by software EWB</li> </ul>	
5.		<ul style="list-style-type: none"> <li>Proportional and proportional integral control of pressure</li> </ul>	
6.		<ul style="list-style-type: none"> <li>(P) Control of flow</li> </ul>	
7.		<ul style="list-style-type: none"> <li>(PI) and (PD) control of flow</li> </ul>	
8.		<ul style="list-style-type: none"> <li>(P) Control of temperature using analog controller</li> </ul>	
9.		<ul style="list-style-type: none"> <li>Program and control the liquid level by using PLC</li> </ul>	
10.		<ul style="list-style-type: none"> <li>On-off process control system (level control)</li> </ul>	

**Evaluation Strategies:**

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

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



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**Teaching Methodology:**

- ❖ Lab. work

**Text Books & References:**

1. Soft ware EWB or multsim 2001, available for educational community.
2. Process Control and Transducers DL 2314.
3. Technovate. Automatic and process control technology experiments.





# Engineering Program

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



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

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





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"> <li>▪ Fuses.</li> <li>▪ Switches.</li> <li>▪ Circuit Breakers.</li> <li>▪ Timers.</li> <li>▪ Relays.</li> <li>▪ Power Transformer &amp; Current transformer.</li> </ul>	8 weeks
2.	Star – Delta Control Box	<ul style="list-style-type: none"> <li>▪ Introduction.</li> <li>▪ Equipment Required.</li> <li>▪ Procedure.</li> <li>▪ Controlling Connection.</li> <li>▪ Meters &amp; indication lights.</li> <li>▪ Trouble shooting.</li> </ul>	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



# Engineering Program

Specialty	Instrumentation and Process Control
Course Number	13203062
Course Title	Signal Conditioning and Processing
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



**Brief Course Description:**

- ❖ The course covers important issues related to noise and guarding techniques, filtering, signal conversion and data acquisition and transmission.

**Course Objectives:**

The course objective is to make the student familiar with the different operations carried on the electrical signals to make them clean, without noise with an adequate characteristics for further implementation.

**Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.	Principles of analog signal conditioning	<ul style="list-style-type: none"> <li>Signal level changes, linearization, conversions and impedance matching</li> </ul>	
2.	Amplification of signals	<ul style="list-style-type: none"> <li>Operational amplifiers, differential amplifiers, instrumentation amplifiers, and isolation amplifiers</li> <li>Impedance matching</li> </ul>	
3.	Modulation and detection	<ul style="list-style-type: none"> <li>Amplitude, phase, and frequency modulation and demodulation</li> <li>F/V and V/F converters, detection of absolute value. Zero detector, peak detector and comparators</li> </ul>	
4.	Logarithmic amplifiers and analog multiplication	<ul style="list-style-type: none"> <li>Logarithmic amplifiers, multipliers, dividers and their applications</li> </ul>	
5.	Filtering and analog signal analysis	<ul style="list-style-type: none"> <li>LPF, HPF, PBF, PBR filters. Filters circuits and frequency characteristics. Introduction to active filters</li> <li>Signal analyzers. Frequency analysis methods of frequency analyzers</li> </ul>	
6.	RMS measurements and noise	<ul style="list-style-type: none"> <li>Meaning of RMS detector, RMS and true RMS values, examples</li> </ul>	

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

		<ul style="list-style-type: none"> <li>Types of noise in electronic systems, ground loops, guarding techniques</li> </ul>	
7.	<b>Data acquisition and conversion</b>	<ul style="list-style-type: none"> <li>Introduction. Signal conditioning of inputs</li> <li>Single channel data acquisition system</li> <li>Multichannel data acquisition system</li> <li>Data conversion</li> <li>A/D and D/A conversions</li> <li>Multiplexers and sample and hold circuits</li> </ul>	
8.	<b>Introduction to digital signal transmission</b>	<ul style="list-style-type: none"> <li>Introduction</li> <li>Data transmission systems</li> <li>Pulse code formats</li> <li>Modulation techniques for digital data transmission</li> </ul>	

#### 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:

- Instrumentation. Devices and systems, CS Rangan, GR Sarma, VSV mani Tata McGraw hill-1995, India.
- Principles of measurement and instrumentation; Ian S. Morris, Prentice Hall, 1993, London.

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



# Program Engineering

Specialty	Instrumentation and Process Control
Course Number	20306232
Course Title	Signal Conditioning and Processing Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3





**Brief Course Description:**

- ❖ The course covers the following topics: signal amplification, filtering, modulation and demodulation, conversion and detection and data acquisition.

**Course Objectives:**

The course objective is to give students practical skills related to signal conditioning and processing.



**Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.		<ul style="list-style-type: none"> <li>Investigation of the characteristics of I/V converter and V/I converter by using op. amplifiers</li> </ul>	
2.		<ul style="list-style-type: none"> <li>Investigation of the characteristics of instrumentation. Amplifiers (IC), or building an IA by using (3) operational amplifiers</li> </ul>	
3.		<ul style="list-style-type: none"> <li>Investigation of the work of the comparator and window comparator in order to generate a square pulse wave with a given period</li> </ul>	
4.		<ul style="list-style-type: none"> <li>Investigation of the characteristics of a logarithmic amplifier and to implement this amplifier to realize an analog multiplier</li> </ul>	
5.		<ul style="list-style-type: none"> <li>Practical study of the frequency characteristic of passive and active LPF and HPF by using (EWB) software</li> </ul>	
6.		<ul style="list-style-type: none"> <li>Practically determine the input/output characteristics of an exclusive-or phase detector</li> <li>Determine the I/O characteristics of the Motorola MC4044 integrated-circuit phase detector</li> </ul>	
7.		<ul style="list-style-type: none"> <li>Demonstration of the operation of a simple 3-decade frequency synthesizer using MC4024, MC4044 and 74192 integrated circuits</li> </ul>	

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





**Evaluation Strategies:**

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

**Teaching Methodology:**

- ❖ Lab. work

**Text Books & References:**

1. Design of OP-AMP Circuits with experiments, Howard M. Berlin Pernick Printing Corp, Manila, 1986.
2. Design of phase-locked loop circuits with experiments, Howard M. Berlin Howard W. Sams company, 1989, U.S.A.



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