كلية الهندسة التكنولوجية        جامعة البلقاء التطبيقية

# الخطط الدراسية لبرنامج الشهادة

# الجامعية المتوسطة

# تخصص إلكترونيات الصناعية

# 2008/2009

# بإشراف عميد الكلية الأستاذ الدكتور قاظم جابر

# Curriculum for Associate Degree Program
# in
# Industrial Electronics specialization

The curriculum of associate degree in **"Industrial Electronics"** 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
## Industrial Electronics 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 follows:

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

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

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

| Course No. | Course Title | Credit Hours | Weekly Contact Hours | | Prerequisite |
|---|---|---|---|---|---|
| | | | Theoretical | Practical | |
| 20301113 | Electrical Circuits | 3 | 3 | 0 | 21302111* |
| 20301114 | Electrical Circuits Lab | 1 | 0 | 3 | 20301113* |
| 20403111 | Electronics | 3 | 3 | 0 | 20301113* |
| 20403112 | Electronics Laboratory | 1 | 0 | 3 | 20403111* |
| 20404121 | Digital Fundamentals | 2 | 2 | 0 | 20403111 |
| 20404122 | Digital Fundamentals Laboratory | 1 | 0 | 3 | 20404121* |
| 20401111 | Power Electronics | 3 | 3 | 0 | 20403111 |
| 20401112 | Power Electronics Laboratory | 1 | 0 | 3 | 20401111* |
| 20308211 | Transducers | 3 | 3 | 0 | 20404121 |
| 20308212 | Transducers Laboratory | 1 | 0 | 3 | 20308211* |
| 20304111 | Electrical Machines | 3 | 3 | 0 | 20301113 |
| 20304114 | Electrical Machines Laboratory | 1 | 0 | 3 | 20304112* or 20304113* |
| 20301131 | Engineering Software | 1 | 0 | 3 | 21702101 |
| 20307231 | Electrical Motor Drive Systems | 3 | 3 | 0 | 20304111 |
| 2030732 | Electrical Motor Drive Systems Laboratory | 1 | 0 | 3 | 20307231* |
| 20404211 | Microprocessors | 3 | 3 | 0 | 20404121 |
| 20404212 | Microprocessors Lab | 1 | 0 | 3 | 20404212* |
| 20307221 | Programmable Logic Controllers | 3 | 3 | 0 | 20404121 |
| 20307222 | Programmable Logic Controllers Laboratory | 1 | 0 | 3 | 20307221* |
| 20404215 | Microprocessors and PLCs Applications Laboratory | 1 | 0 | 3 | 20307221* |
| 20401291 | Training** | 3 | 0 | - | - |
| 20401292 | Project | 3 | 0 | - | - |
| **Total** | | **43** | **26** | **33** | |

\*- Co-requisite
** Equivalent to 280 training hours

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

## Guiding Plan

| First Year | | | | | |
|---|---|---|---|---|---|
| **First Semester** | | | **Second Semester** | | |
| **Course ID** | **Course Name** | **Credit Hours** | **Course ID** | **Course Name** | **Credit Hours** |
| 22002101 | English Language | 3 | 22001101 | Arabic Language | 3 |
| 21702101 | Computer Skills | 3 | 20201111 | Engineering Workshops | 1 |
| 20204111 | AutoCAD | 2 | 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 |
| 21901100 | Islamic Culture | 3 | 20403111 | Electronics | 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** |
| 20401112 | Power Electronics Lab. | 1 | 20307221 | PLCs | 3 |
| 20301131 | Engineering software | 1 | 20307222 | PLCs Lab. | 1 |
| 20404122 | Digital fundamentals Lab. | 1 | 20404215 | Microprocessors and PLCs Applications Lab. | 1 |
| 20304111 | Electrical Machines | 3 | 20401291 | Training | 3 |
| 20308211 | Transducers | 3 | 20401292 | Project | 3 |
| 20308212 | Transducers Lab. | 1 | 21702111 | Communication Skills and Technical writing | 3 |
| 20404211 | Microprocessors | 3 | 20307231 | Electrical Motor Drive Systems | 3 |
| 20401111 | Power Electronics | 3 | 20307232 | Electrical Motor Drive Systems Lab. | 1 |
| 20404212 | Microprocessors Lab. | 1 | | | |
| 20304114 | Electrical Machines Lab. | 1 | | | |
| **Total** | | **18** | **Total** | | **18** |

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

**Brief Description for Associate Degree in Engineering Program Specializations**

*University Requirements*

| Course Title | Course No | Credit Hours ( Theoretical /Practical) |
|---|---|---|
| **Arabic Language** | **22001101** | **3 (3-0)** |

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 وتذوقها وتحليلها تحليلا أدبيا؛ تنمية الذوق الجمالي لـدى الطـلاب الدارسين.

| **English Language** | **22002101** | **3 (3-0)** |
|---|---|---|

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.

| **Islamic Culture** | **21901100** | **3 (3-0)** |
|---|---|---|

١. تعريف الثقافة الإسلامية وبيان معانيها وموضوعاتها والنظم المتعلقة بها – وظائفها وأهدافها.

٢. مصادر ومقومات الثقافة الإسلامية والأركان والأسس التي تقوم عليها.

٣. خصائص الثقافة الإسلامية.

٤. الإسلام والعلم، والعلاقة بين العلم والإيمان

٥. التحديات التي تواجه الثقافة الإسلامية.

٦. رد الشبهات التي تثار حول الإسلام.

٧. الأخلاق الإسلامية والآداب الشرعية في إطار الثقافة الإسلامية.

٨. النظم الإسلامية.

| **Computer Skills** | **21702101** | **3 (1-4)** |
|---|---|---|

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.

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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: Rolls 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.

## 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.

| Transducers | 20308211 | 3 (3-0) |
|---|---|---|

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) |
|---|---|---|

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

| Electrical Machines | 20304111 | 3 (3-0) |
|---|---|---|

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

| Electrical Machines Lab. | 20304114 | 1 (0-3) |
|---|---|---|

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

| Engineering Software | 20301131 | 1 (0-3) |
|---|---|---|

Automated electrical engineering drawing using computer graphic packages. Electrical block and wiring diagrams symbols of basic elements of electrical and electronic circuits, devices and machines. Block diagram of electrical & electronic systems. Schemes reading.

| Electrical Motor Drive Systems | 20307231 | 3 (3-0) |
|---|---|---|

Definition of electrical drive system. Elements of electrical drive system. DC and AC drive systems. Conversion of electrical energy into mechanical energy. Transmission of mechanical power. Main characteristics and modes of drive systems. Principles of  speed control in drive systems using timers, relays, limit switches and speed signals. Open-loop speed control using variable voltage, flux and resistance in armature circuit. Closed-loop control of motor speed. Servo drives systems. Static control using ICs, and microprocessors

| Electrical Motor Drive Systems Lab. | 20307232 | 1 (0-3) |
|---|---|---|

Investigation of torque/speed characteristics of drive systems. Automatic start, stop and reverse of drive systems. Speed control. Effect of feedback on torque/ speed characteristics. Servo drives

| Microprocessors | 20404211 | 3 (3-0) |
|---|---|---|

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

| Microprocessors Lab. | 20404212 | 1 (0-3) |
|---|---|---|

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

| Microprocessors and PLCs Applications Lab. | 20404215 | 1 (0-3) |
|---|---|---|

Typical applications of PLCs in industrial control. Programming, control circuits and schematic diagrams.

| 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 di8screate 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 gunters 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 | 20401291 | 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 | 20401292 | 3 |
|---|---|---|

An integrated assembly/design practical work related to the major fields of study.

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**Al-Balqa' Applied University**

جامعة البلقاء التطبيقية

تأسست عام 1997

# 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** | • Introduction<br>• Decimal, binary, octal and hexadecimal numbers system<br>• Number system conversion<br>• Binary arithmetic<br>• 1's and 2's complement of binary number<br>• binary coded decimal (BCD)<br>• digital coded (Gray,Excess-3 and ASC II codes) | **2 Weeks** |
| 2. | **LOGIC GATES** | • The inverter<br>• The AND gate<br>• The OR gate<br>• The NAND gate<br>• The NOR gate<br>• The Exclusive-OR and Exclusive-AND gates<br>• Application of logic gates in industry | **2 Weeks** |
| 3. | **BOOLEAN ALGEBRA AND LOGIC SIMPLIFICATION** | • Boolean operation and expressions<br>• Laws and rule of Boolean algebra<br>• De Morgan's theorem<br>• Simplifications using Boolean algebra<br>• Standard forms of Boolean expression<br>• The Karnaugh map<br>• Karnaugh map minimization | **2 Weeks** |
| 4. | **COMBINATIONAL LOGIC** | • Implementing combinational logic<br>• The universal property of NAND and NOR gates<br>• Implementation using NAND and NOR gates<br>• Operation with pulse waveforms<br>• Troubleshooting and application | **2 Weeks** |
| 5. | **FUNCTIONS OF COMBINATIONAL LOGIC** | • Half adders, full adders, parallel adders<br>• Comparators<br>• Encoders and decoders<br>• Multiplexing | **2 Weeks** |

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

| | | | |
|---|---|---|---|
| | | ▪ Application | |
| 6. | **FLIP-FLOPS** | ▪ Sequential logic circuits <br> ▪ Edge-trigged Flip-Flops (S-R, J-K, D) <br> ▪ Master-slave Flip-Flops <br> ▪ Flip-Flop operation characteristic <br> ▪ Flip-Flops application | **2 Weeks** |
| 7. | **COUNTERS** | ▪ Asynchronous counters <br> ▪ Synchronous counters <br> ▪ Up/Down synchronous <br> ▪ Cascaded counters <br> ▪ Counter application | **2 Weeks** |
| 8 | **SHIFT REGISTERS** | ▪ Basic shift registers functions <br> ▪ Serial in / serial out shift registers <br> ▪ Serial in / parallel out shift registers <br> ▪ parallel in / serial out shift registers <br> ▪ parallel in / parallel out shift registers | **Week** |
| 9 | **MEMORIES** | ▪ Basic of semiconductors memories <br> ▪ Read-only memories (ROMs) <br> ▪ Programmable ROMs (PROMs and EPROMs) <br> ▪ Read/Write Random –Access Memories(RAMs) <br> ▪ Memory expansion | **Week** |

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

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

**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 |

**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** |

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

**طرق التقييم المستخدمة:**

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

**طرق التدريس:**
1. المختبر
2. تطبيق التجربة
3. المناقشة
4. عروض power point

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

# Al-Balqa' Applied University

جامعة البلقاء التطبيقية

تأسست عام 1997

# Engineering Program

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

**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><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. | **Ohm's Law, Energy and Power** | <ul><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. | **Series Circuits** | <ul><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. | **Parallel Circuits** | ▪ Resistors in Parallel<br>▪ Voltage in a Parallel Circuit<br>▪ Kirchhoff's Current Law<br>▪ Total Parallel Resistance<br>▪ Application of Ohm's Law<br>▪ Current Sources in Parallel<br>▪ Current Dividers<br>▪ Power in Parallel Circuits | 1 |
| :-: | :-: | :-- | :-: |
| 5. | **Series-Parallel Circuits** | ▪ Identifying Series-Parallel Relationships<br>▪ Calculations of Series-Parallel Resistive Circuits<br>▪ Voltage Dividers with Resistive Loads<br>▪ The Wheatstone Bridge<br>▪ The Superposition Theorem | 3 |
| 6. | **Introduction to Alternating Current and Voltage** | ▪ The Sinusoidal Waveform<br>▪ Sinusoidal Voltage Sources<br>▪ Sinusoidal Voltage and Current Values<br>▪ Angular Measurement of a Sine Wave<br>▪ The Sine Wave Formula<br>▪ Introduction to Phasors<br>▪ Analysis of AC Circuits<br>▪ Superimposed DC and AC Voltages<br>▪ Nonsinusoidal Waveforms<br>▪ The Oscilloscope<br>▪ Concepts of phasors, complex numbers, rectangular and polar forms of complex numbers, mathematical operations.<br>▪ Three-phase voltage and current | 5 |

| | | <ul><li>Y and Δ 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</li><li>phase voltage and currents in star connection (Y) and delta connection (Δ)</li><li>Mesh method of connection loads with alternator</li><li>Active, reactive and apparent power in three phase circuits<ul><li>Analysis of balanced phase circuits</li><li>Balanced and unbalanced three-phase circuits.</li><li>AC circuit measurement</li></ul></li></ul> | |
|:---:|:---:|---|:---:|
| 7. | **Capacitors** | <ul><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. | **Inductors** | <ul><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. | **RLC Circuits and Resonance** | <ul><li>RC Circuits</li><li>RL Circuits</li><li>RLC Circuits</li><li>Resonance circuit</li></ul> | 2 |

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

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

# 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.

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 |

**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 2008/2009**

# Engineering Program

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

**وصف المادة الدراسية:**

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

**أهداف المادة الدراسية:**

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

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

الوصف العام:

| رقم الوحدة | اسم الوحدة | محتويات الوحدة | الزمن |
|---|---|---|---|
| 1. | **Magnetic Circuits** | ▪ I-H relation<br>▪ B-H relation<br>▪ Magnetic equivalent circuit<br>▪ Hysteresis losses<br>▪ Eddy current losses<br>▪ Core losses | 2 weeks |
| 2. | **Transformers** | ▪ Construction and principle of operation<br>▪ EMF Equation<br>▪ Practical transformer; referred equivalent circuit<br>▪ Open – circuit test<br>▪ Short – circuit test<br>▪ Full – load copper losses.<br>▪ Efficiency ,all – day efficiency ,maximum efficiency<br>▪ Voltage regulation<br>▪ I deal transformer<br>▪ Auto transformer<br>▪ Three – phase transformers | 3 weeks |
| 3. | **Direct Current Machines** | ▪ Construction and principle of operation<br>▪ Armature windings<br>▪ Developed torque<br>▪ DC generators, types; characteristics, interlopes, armature reaction , voltage regulation .<br>▪ DC Motors, types; mechanical characteristics; losses and efficiency speed control | 4 weeks |
| 4. | **Three – Phase Indication Motors** | ▪ Introduction<br>▪ Construction and types<br>▪ Rotating magnetic field<br>▪ Induced E.M.F<br>▪ Slip | 1 weeks |

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

| | | ▪ Performance characteristics<br>▪ No – load test<br>▪ Blocked – rotor test<br>▪ Speed control ,pole changing , line voltage control; line frequency<br>▪ Control , rotor resistance control | |
|---|---|---|---|
| 5. | **Single – phase Induction Motors**<br>. | ▪ Double revolving field theory<br>▪ Types , capacitor – start motor ,split – phase motor ; shade –<br>▪ Pole motor, capacitor – start and run motor, universal motor.<br>▪ Characteristics and typical applications<br>▪ Speed control | **2 weeks** |
| 6. | **Synchronous Machines**<br>. | ▪ Construction of 3-ph synchronous machine<br>▪ Synchronous generators , principle of operation , types<br>▪ characteristics , armature reaction , voltage regulation<br>▪ Synchronous motors , principle of operation , power and torque<br>▪ characteristics , P.F control speed control , applications | **2 weeks** |
| 7. | **Special Machines**. | ▪ DC servomotor, construction and applications.<br>▪ AC servomotor, construction and applications.<br>▪ Stepper motor, types, construction and applications.<br>▪ Linear indication motor ,construction and applications<br>▪ Linear synchronous motor ,construction and applications | **1 week** |
| 8. | **Vibration and Noise Problems in Electrical Machines** | ▪ Introduction<br>▪ Sound field quantities<br>▪ Noise measurements<br>▪ Vibration measurements<br>▪ Vibration and noise reduction<br>▪ Sound damping<br>▪ Technical solutions | **1 week** |

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

**طرق التقييم المستخدمة :**

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

**طرق التدريس:**

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

**الكتب و المراجع :**

1. Principle of Electric Machines and Power Electronics , P.C. Sen , John Wiley and Sons , Inc , 1997
2. Small Electric Motors , Helmut Moczala , Jugen Draeger , Hermann Kraub , 1998
3. Electrical Machines , M.S.Sarma , West Publishing Company , 1994

Electrical machinery Fundamental, Stephen J. Chap man, Mc GRAW , Hill , 1996 .

# Engineering Program

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

**وصف المادة الدراسية:**

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

**أهداف المادة الدراسية:**

Upon the completion of the course, the student will be able to:
1. Make connection of all type of electrical machines , motors , generators and transformers
2. Measure; power ,current, voltage and cosup of electrical machines
3. Measure sped of different types motor
4. Draw the characteristics of transformers ,motors and generators
5. Calculate the parameters of electrical machines

الوصف العام:

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

❖ **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 :

المراجع:

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

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

# Engineering Program

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

**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><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. | **The Diode** | <ul><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. | **Special – Purpose Diode** | <ul><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. | **Applications of The Diode** | <ul><li>Half – wave and full – wave rectifiers</li><li>Filters and regulators in power supply circuits.</li></ul> | 1 weeks |
| 5. | **Bipolar Junction Transistor (BJT)** | <ul><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><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. | **Field – Effect Transistor( FET)** | <ul><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> | **2 week** |
| 7. | **Oscillators** | <ul><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> | **1 week** |

| 8. | **Operational Amplifiers** | ▪ Symbol, terminals and basic op-amp representations (idea and practical) | **1 week** |
|---|---|---|---|
| 9. | **Thyristor and Other Devices** | ▪ Structure ,principle of operation<br>▪ 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** | ▪ 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 2008/2009

# 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** | ▪ Forward and reverse biasing.<br>▪ Characteristic curve.<br>▪  Data sheet. | **2 weeks** |
| 2. | **The zener Diode.** | ▪ Breakdown voltage.<br>▪ Regulation.<br>▪ Characteristic curve.<br>▪ Data sheet | **2 weeks** |
| 3. | **Rectification Circuits with Filter and Regulator** | ▪ Half- wave and full- wave.<br>▪ Ripple factor.<br>▪ 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 2008/2009**

**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.

# Engineering Program

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

**Brief Course Description:**
  Introduction to microprocessors architecture, instruction set, assemblers and assembly language programming, software development, microprocessors applications.

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

**Detailed Course Description:**

| Unit Number | Unit Name | Unit Content | Time Needed |
|:---:|:---:|:---|:---:|
| 1. | **Introduction to microprocessors** | ▪ Computing and microprocessors<br>▪ Large and small computers<br>▪ Comparison of typical computers<br>▪ Semiconductor technologies<br>▪ Semiconductor memories | **2 Weeks** |
| 2. | **Microprocessor architecture** | ▪ General computer architecture<br>▪ Registers<br>▪ Arithmetic unit<br>▪ Instruction handling area<br>▪ Stacks<br>▪ Examples of microprocessor architecture | **3 Weeks** |
| 3. | **Microprocessor instruction set** | ▪ Computer instruction formats<br>▪ Addressing Methods<br>▪ Types of instructions<br>▪ Microprocessor instruction sets<br>▪ Examples of microprocessor instruction sets | **2 Weeks** |
| 4. | **Microprocessor assembler** | ▪ Comparison of language levels<br>▪ Features of assemblers<br>▪ Features of microprocessor assemblers<br>▪ Examples of assemblers, Intel 8080 and Motorola 6800 | **2 Weeks** |
| 5. | **Assembly language programming** | ▪ Simple programs<br>▪ Loops and arrays<br>▪ Arithmetic | **2 Weeks** |
| 6. | **Software development for microprocessors** | ▪ The tasks of software development | **1 Week** |
| 7. | **Some Applications of Microprocessos** | ● Test and instrumantaions<br>● Communications<br>● Computers<br>● Indstrial<br>● Business Equipment<br>● Transportaion<br>● Commerical applications | **2 Weeks** |

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

طرق التقييم المستخدمة :

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

**طرق التدريس:**
1. المحاضرة
2. المناقشة
3. عروض power point

**الكتب والمراجع:**

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

# Engineering Program

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

**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:**

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

**طرق التقييم المستخدمة :**

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

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

**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

# Al-Balqa' Applied University

جامعة البلقاء التطبيقية

تأسست عام 1997

| 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 neded |
|--------|------------|---------------|------------|
| 1 | **PLC architecture** | ▪ Block diagram of a general purpose PLC<br>▪ Memory types and the memory map of the PLC<br>▪ Describe I/O modules<br>▪ Analysis of I/O modules<br>▪ Purchasing PLCs | |
| 2 | **General PLC Programming procedures** | ▪ Programming equipment<br>▪ Programming formats<br>Process Scanning Considerations | |
| 3 | **PLC Programming Languages** | ▪ Electrical wiring ladder diagrams<br>▪ Logic ladder diagrams<br>▪ Ladder diagram rules<br>▪ Instruction sets<br>▪ Examples | |
| 4 | **Program control instructions** | ▪ Latching relay instruction<br>▪ Master control input instruction<br>▪ Immediate output instruction<br>▪ One shot instruction<br>▪ Jump instruction<br>▪ Other instructions<br>▪ Examples | |
| 5 | **Arithmetic and logic operations and data manipulation** | ▪ Addition, subtraction, multiplication and division instructions<br>▪ Increment and decrement instructions<br>▪ Logic AND, OR, NOR, XOR instructions<br>▪ Duty cycle generator<br>▪ Timers instructions | |

| | | | |
|---|---|---|---|
| | | ▪ Set, reset instruction <br> ▪ Move, compare, rotate and shift register instructions Examples | |
| 6 | **Programming counters** | ▪ Programming UP counters <br> ▪ Programming Down counters <br> ▪ Programming Up-Down counters <br> ▪ Programming ring countersExamples | |
| 7 | **Programming timers** | ▪ Programming TON and TOFF timers <br> ▪ Programming accumulator timers (TMR) <br> ▪ Programming monostable (TMON) and retriggerable monostable timersExamples | |
| 8 | **Installation, trouble- shooting and maintenance** | ▪ Introduction <br> ▪ PLC status indicators and alarms <br> ▪ Troubleshooting flow charts and tables <br> ▪ System troubleshooting techniques. <br> ▪ PLC maintenance techniques | |

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□ **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:**

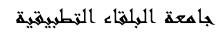| 1. Lecture |
|---|

**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 cary 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 conttent | 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 coutrol 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, Semens 1995

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

# Engineering Program

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

**Brief Course Description:**

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

**Course Objectives:**

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

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

**Detailed Course Description:**

| Unit. number | Unite name | Unite content | Time Needed |
|---|---|---|---|
| 1. | **Power Semiconductor Devices** | ▪ Diodes. Thyristors. Triacs. Gate Turn-Off Thyristors (GTOs). Bipolar Power or Junction Transistors (BPTs or BJTs). Power MOSFETs. Static Induction Transistors (SITs). Insulated Gate Bipolar Transistors (IGBTs). MOS-Controlled Thyristors (MCTs). Integrated Gate-Commutated Thyristors (IGCTs). Power Integrated Circuits (PICs) | |
| 2. | **Diodes and Phase-Controlled Converters** | ▪ Diode Rectifiers. Thyristor Converters. Converter Control | |
| 3. | **Frequency Changers** | ▪ Classification and applications. Block diagrams and principle of operation. Examples: Phase-Controlled Cycloconverters. Matrix Converters. High-Frequency Cycloconverters | |
| 4. | **Voltage-Fed Converters** | ▪ Single-Phase Inverters. Three-Phase Bridge Inverters. Multi-Stepped Inverters. Pulse Width Modulation Techniques. Three-Level Inverters. Hard Switching Effects. Resonant Inverters. Soft-Switched Inverters. PWM Rectifiers | |
| 5. | **Current-Fed Converters** | ▪ General Operation of a Six-Step Thyristor Inverter. Load-Commutated Inverters. Force-Commutated Inverters. Multi-Stepped Inverters. Inverters with Self-Commutated Devices. Current-Fed vs Voltage-Fed Converters | |
| 6. | **Choppers** | ▪ Classification, principle of operation, applications | |

**Evaluation Strategies:**

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

**eaching Methodology:**

❖ Lectures

**Text Books & References:**

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

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

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جامعة البلقاء التطبيقية

تأسست عام 1997

# Engineering Program

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

**Brief Course Description:**

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

**Course Objectives:**

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

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

**Detailed Course Description:**

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

**Evaluation Strategies:**

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

**Teaching Methodology:**
  ❖ Lab. work

**Text Books & References:**
**References :**
   Instructional Lab. Sheets

| 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** | ▪ Active and passive transducers, linear and nonlinear transducers, basic requirements of transducers, applications of transducers in measurements and control | |
| 2. | **Transducers characteristics** | ▪ Static and dynamic characteristics<br>▪ First order and second order transducers<br>▪ Primary and secondary transducers<br>▪ Examples | |
| 3. | **Elastic pressure transducers** | ▪ Bourdon tubes<br>▪ Diaphragms, bellows, application examples | |
| 4. | **Strain transducers** | ▪ Lateral and axial strain<br>▪ Static and dynamic strain<br>▪ Wire strain gauges and semiconductor strain gauges<br>▪ Effect of temperature on strain gauges performance<br>▪ 1/4 bridge, 1/2 bridge and complete bridge strain gauges | |
| 5. | **Potentiometric transducers** | ▪ Types of potentiometric transducers and their applications<br>▪ Using of operational amplifies and Whetston bridges for signal conditioning | |
| 6. | **Capacitive transducers** | ▪ Principle of operation and basic relations<br>▪ Circuit analysis and applications<br>▪ Capacitive proximity sensors | |
| 7. | **Piezoelectric transducers** | ▪ Basic theory and types of piezoelectric transducers | |

| | | | |
|---|---|---|---|
| | | ▪ Forward and reverse piezoelectric transducers<br>▪ Piezoelectric strain gauges<br>▪ Applications of piezoelectric transducers | |
| **8.** | **Inductive transducers** | ▪ Principle of operation and basic relations<br>▪ Variable inductance transducers<br>▪ Variable reluctance transducers<br>▪ Eddy current transducers<br>▪ Inductive proximity sensors<br>▪ Applications of inductive transducers for displacement measurement and in tachometry and torque measurements | |
| **9.** | **Temperature transducers** | ▪ Bimetallic temperature sensors, RTDs. Thermocouples and thermopiles<br>▪ I.C temperature transducers | |
| **10.** | **Environmental transducers** | ▪ Smoke and fire detectors<br>▪ Sound, infrasound and ultrasound sensors<br>▪ Humidity sensors | |
| **11.** | **Optical transducers** | ▪ 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% | --/--/---- |

☐ **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

| 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% | |
| | | | |

□ **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