# Course Descriptions وصف المقررات

**Department:** Electronics Engineering **القسم:** الهندسة الإلكترونية

**Program:** Bachelor Of Industrial Electronics And Automated Control Engineering **البرنامج:** بكالوريوس هندسة الالكترونيات الصناعية والتحكم الآلي

## University Requirements متطلبات الجامعة

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| **BUST01 Skill of Holy Quran Recitation & Tajweed** | **(2P) 1 credits** |
| يعد هذا المقرر من المقررات المهمة؛ كونه متعلق بكلام الله تعالى ثم إنه من متطلبات الجامعة، وهو مقرر نظري وتطبيقي يقوم الطالب فيه بتلاوة وحفظ نصف جزء عم من سورة (الطارق- الناس )، ودراسة الآداب التي ينبغي أن يتحلى بها قارئ القرآن، وفهم وتطبيق هذه الأحكام عند قراءة القرآن الكريم، وتستخدم طريقتي الحوار والمناقشة في التدريس، ويتم تقييم الطالب من خلال تلاوته للقرآن أثناء اللقاءات التعليمية، والقيام بالتكليفات المصاحبة – الصفية واللا صفية – مع الامتحانين النصفي والنهائي. | |
| **BUST02 English Language (1)** | **(8P) 4 credits** |
| The current course provides students with the language basics of everyday English to help them communicate in different real life situations. The course focuses more on real life conversations and the basic grammars that will help each one in his/her major.<br>Moreover, the course provides students with plenty of writing and speaking practices. The updates of the book allow students to be posted with the latest language uses and functions that are easy and useable in real life situations. | |
| **BUST03 Arabic Language** | **(2L,4P) 4 credits** |
| يهتم المقرر بتنمية المهارات اللغوية الأساسية للطالب كونه من متطلبات الجامعة، ويتناول جملة من النشاطات الاتصالية والدروس اللغوية والإملائية والتركيبية ويحتوي على معارف ونصوص وتدريبات لغوية، ويتألف من كتابين:<br>الأول يركز على مهارتي الاستماع والتحدث، والثاني يركز على مهارتي القراءة والكتابة، مع احتواء كل من الكتابين على أساسيات التركيب النحوي وبعض القواعد الإملائية، ويعتمد المقرر أسلوب التدريبات والتطبيقات العملية لكل طالب، بالإضافة إلى النصوص التطبيقية في CD المرفق بالكتاب مع الامتحان النصفي والنهائي. | |
| **BUST04 Leadership Skills Development** | **(1L) 1 credits** |
| يهدف المقرر الى تنمية بعض المهارات القيادية والإدارية لدى الدارسين، وتنمية فرص التميز لديهم، من خلال تعريفهم بسمات الشخصية القيادية والإدارية، وأهم طرق واساليب التحول من التبعية الى القيادة، وتعريفهم بأهم استراتيجيات التميز والتفاعل القيادي، اضافة الى تنمية بعض مهارات وأخلاقيات القيادة والإدارة المتعلقة بالتخطيط وادارة الذات والآخرين، وطرق واساليب اتخاذ القرارات الفعالة، واساليب التحفيز، واساليب التحفيز، ومهارات قيادة التغيير، وأخلاقيات الإدارة والقيادة. | |
| **BUST05 Islamic Culture** | **(4L) 4 credits** |
| يعد مقرر الثقافة الإسلامية من أهم المقررات الدراسية وذلك للدور الذي يساهم فيه هذا المقرر في تكوين الشخصية المسلمة القادرة على قراءة ماضيها وفهم واقعها والإسهام الإيجابي في بناء المستقبل بناءً يوافق شرع الله ويلبي احتياجات العصر من غير إفراط ولا تفريط (بوسطية). ويتم أخذ هذا المقرر بطريقة الحوار والمناقشة، كما يكلف فيه الطلبة بالبحوث التي تخدم أهداف المقرر. ويتم تقييم الطلبة عن طريق المشاركة الصفية واللاصفية والأعمال التي يكلف بها الطلبة والاختبارات النصفية والنهائية. | |



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| **BUST06 English Language (2)** | **(8P) 4 credits** |
|---|---|
| The current course provides students with the language basics of everyday English to help them communicate in different real life situations. The course focuses more on real life conversations and the basic grammars that will help each one in his major.<br>Moreover, the course provides students with plenty of writing and speaking practices. The updates of the book allow students to be posted with the latest language uses and functions that are easy and useable in real life situations. | |
| **BUST07 Communications Skills** | **(1L ) 1 credits** |
| يهدف مهارات الاتصال إلى إلمام الطالب بالنظريات والمفاهيم الأساسية في مجال الاتصال الإنساني، وتنمية المهارات الأساسية في مجال التواصل الجيد مع الذات ومع الآخرين، وتعزيز ممارستها في حياته اليومية والعملية باستخدام أساليب جدية تعتمد على التدريب والتقويم المتنوع والفعال، بما يسهم في إنجاح حياته الخاصة والعملية على حد سواء. | |
| **BUST08 Critical Thinking** | **(1L) 1 credits** |
| التفكير الناقد مادة هدفها الأساسي بناء وتنمية مهارة الطلاب الذهنية في مجال التعامل مع الآراء والأفكار المقروءة أو المسموعة أو المرئية لإبداء الرأي المؤيد أو المعارض استنادا إلى المهارات الذهنية المنظمة، والمهارات المعرفية والخبرات والتجارب.<br>يتضمن العديد من الموضوعات الرئيسة كمفهوم التفكير الناقد وفائدته العملية والتعليمية و في الفصل الدراسي ، ومعاييره ، ومعوقاته ومقوماته الأساسية والمساعدة ، وكيفية بناء حجج مقنعة بالاستناد إلى الاستدلال الناقد ،مع بيان صور المغالطات والخدع البلاغية ، ثم توجت المادة بخاتمة تضمنت تطبيق مهارات التفكير على بعض الظواهر والمجالات الحيوية في الحياة ، والطريقة المثلى لتدريسها تكاد تنحصر في الجانب النظري من خلال المحاضرات والمداخلات والمناقشات المستفيضة ، مع تعزيز ذلك بقدر كبير من الأساليب التدريبية ، كلعب بعض الأدوار ، وعرض مقاطع فيديو بالصوت والصورة، وإجراء بعض المناظرات، خصص لتدريسها والتدريب على بعض مفاهيمها 14 ساعة في الفصل الدراسي الواحد ، وتدرس بنظام الساعة (زمن المحاضرة ساعة واحدة ). | |
| **BUST09 Computer Skills** | **(6P) 3 credits** |
| This course provides a student by basic skills for using computer at studying environment, library, and at home. It presents the knowledge of basic computer and information technology concepts. The course provides the knowledge needed to operate and utilize the operating system and office software package, and to use the computer for Internet access and electronic communication. | |
| **BUST10 Research Methodology** | **(2L) 2 credits** |
| يُعد هذا المقرر من أهم المقررات الدراسية كونه يمكن الطالب الجامعي من المهارات التي تساعده على انجاز بحث التخرج، وهو يعمل على إكسابه مجموعة من المعلومات والمعارف حول العلم والمعرفة، والبحث العلمي ومناهجه، وينمي الاتجاهات الإيجابية لدى المتعلم تجاه البحث العلمي، ويتحقق ذلك من خلال مجموعة من الأنشطة الفاعلة (طرائق وأساليب تدريس، ووسائل) كطريقة الحوار والمناقشة، والتعلم الذاتي، والبحث، والتطبيقات، مع استخدام الباوربوينت عند العرض، وتقييم الطالب من خلال المشاركة الصفية والتكليفات المصاحبة – الصفية واللاصفية – والاختبار النصفي والنهائي. | |

## Faculty Requirements متطلبات الكلية

| **BENG01 Mathematics** | **(2L, 2T) 3 credits** |
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| Course discusses the principles of Linear Equations and Applications, Linear Inequalities, Absolute Value in Equations and Inequalities, Quadratic Equations and Applications, Laws of Power and Logarithm, Power and Logarithm Equations, Functions, type of Functions, limited and continuity. | |

رئيس القسم
د.محمد مسعد السويدي



عميد الكلية
د.محمود عبدالعزيز الرميمة

| **BENG02 Engineering Drawing** | **(3L) 3 credits** |
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| The general aim of this course is to provide students with theoretical and practical background in Engineering Drawing. This Course focuses on principles, terminologies, tools of Engineering Drawing to enhance the positive ability of students in being more precise in Drawing and measurements. Teaching strategies this course are lectures and activation the hand skill of student through practical assignment in class as well as home works. Assessment tasks are homework assignment and exams. This course does not have any pre-requests. | |
| **BENG03 Physics** | **(2L, 2T, 2P) 4 credits** |
| The importance of this course is to provide students with physical background of the variable ways to solve real problems. This Course includes physical quantities, vectors, Newton's Laws of Motion, physical prosperities of materials, Waves and sounds, Electricity, Magnetism, Light and Optics. The course carried out using the lectures and self-learning and discussion, Miniature education, solve problems, experiments used to teach this course, We will use strategies assessment Quizzes, Written Examinations, oral examinations, notes, and micro-reports and there are no pre-requests. | |
| **BENG04 Calculus** | **(2L, 2T) 3 credits** |
| Course discusses the principle of limited and show the theories of limited and continue, how to procedure differentiation and its special rules with the study of implicit functions differential, defined the integration and the link between the processes of differentiation and integration, integration rules, methods of integration and its practical applications. | |
| **BENG05 Statistics & Probability** | **(2L, 2P) 3 credits** |
| The Course discusses: displaying the data, measures of central tendency, measures of dispersion, correlation, simple regression, types of random variables and some probability distributions. | |
| **BENG06 Engineering Mechanics** | **(2L, 2T) 3 credits** |
| This course is a combination of Engineering Mechanics (Statics) and Engineering Mechanics (Dynamics). From the Statics point of view, it provides a basic understanding of the part of mechanics which is concerned with the equilibrium of bodies under the action of forces. Topics covered include basic concepts of mechanics and vectors; forces and force systems and their external effects on bodies, principally the conditions of equilibrium of two and three-dimensional systems; free body diagrams and equilibrium of particles and bodies; moments; couples; structural analysis and trusses.<br>From the dynamics point of view, it provides the kinematics and kinetics motion of particles and rigid bodies. The formulation and solution of mechanic problems will help the students developing the ability of logic thinking and effective communication. The analysis will be introduced by examples and assignments. | |



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| Compulsory Department Requirements | متطلبات القسم الإجبارية |
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| **BEL001 Differential Equations** | **(2L, 2T) 3 credits** |
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| This course will provide students with the fundamental concept of Ordinary Differential Equations (ODE) and foundational knowledge. The course will focus on the following: Basic concepts of Differential Equations: Definition, Types, order, and power of (ODE). Solutions of Differential Equations of order one; Separate, Homogeneous and inhomogeneous, Exact and inexact, linear and nonlinear, General Solutions of Homogeneous differential equations of order two by use characteristic equation, Partial Solution of Inhomogeneous Differential Equations of order two by operator differentiation. Some methods will be used in the teaching of this course, such as lectures, problem-solving, Brainstorming, micro- assignments, and micro-report. | |
| **BEL002 Linear Algebra** | **(2L, 2T) 3 credits** |
| This course will provide students with the fundamental concept of linear algebra and foundational knowledge for some engineering courses. This course discusses the basic concepts of matrices; matrix operations, transpose, inverse; determinants; solution of linear systems; eigenvalues and eigenvectors, and their practical applications, the basic concept of graph theory. Some methods will be used in the teaching of this course, such as lectures, problem-solving, Brainstorming, micro- assignments, and micro-report. | |
| **BEL003 Signals and Systems** | **(2L, 2T,2P) 4 credits** |
| This course is an introduction to analog signal processing. It covers the fundamentals of Continuous signals and systems analysis - Classification of Signals and their Operations, Classification of Systems, Systems Response, and Systems Stability. The representations of linear, time-invariant systems are presented in both Differential Equation Model and Convolution-integral Model. Continuous signals and systems representation is developed in the frequency domain through the Fourier series and transform. Laplace transform is also applied to the analysis of continuous signals and systems through their definition and properties. Engineering Applications are drawn broadly, including feedback and control, communications, and signal processing. The course also provides practical materials using Matlab to help students to write codes related to signals and systems analysis. The major teaching strategies include lectures, tutorials and Laboratory works. The course pre-requisite is Differential Equations (BEL001). | |
| **BEL004 Engineering physics** | **(2L, 2T) 3 credits** |
| The general importance of this course is to provide students with the major concepts of Electrostatics and Magneto statics phenomena. It demonstrates various ways of calculating electric field, magnetic fields, electric and magnetic forces, electric potential, electric flux, magnetic flux. The course carried out using the lectures and Problems solving, assignments, lab experiments, Simulation Experiments and self-learning used to teach this course. Evaluation via Written and Oral Examinations, Assignments evaluation, Quizzes, Reports and observation. The prerequisite of this course is physics. | |



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| **BEL005 Electrical Circuits (1)** | **(2L, 2T, 2P) 4 credits** |
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| Electrical circuits (1) is one of the department requirement courses. This course provides the students with the basic concepts and properties of DC electrical circuits and networks. It helps the students to develop their skills to understand the strategies and methods to analyze the circuits in DC. Moreover, it supports students with practical skills to implement the circuits and simulate them via computer programs. Thus, the course contains the fundamentals of common DC electrical circuits, Resistive Network Analysis, inductors and Capacitors Circuits. In addition, it includes transient analysis of R-C and R-L circuits and introduction to alternating current (AC). The teaching strategies include lecture, tutorial, practical, simulations, projects and discussion, problem-solving, research and self-studying. The prerequisite course is BENG03. | |
| **BEL006 Electrical Circuits (2)** | **(2L, 2T, 2P) 4 credits** |
| Electrical circuits (2) is a department requirement course. This course provides the students with the basic concept and properties of ac electrical circuits and networks. It helps the students to develop their skills to understand strategies and methods to analyze the circuits in AC. Moreover, it supports students with practical skills to implement the circuits and simulate them via computer programs. The course contains the fundamentals response of RL, RC and RLC elements to a sinusoidal voltage or current, and frequency response of the basic elements. Moreover, it includes complex numbers analysis, Phasor analysis, series-parallel AC circuits analysis, and other methods and theories to analyze AC circuits using mesh, nodal, superposition, Thevenin's, maximum power. Dependent sources, independent sources, active power, reactive power, apparent power and polyphase systems are also covered during this course. The teaching strategies include lecture, tutorial, practical, simulations, mini-projects and ..etc. The prerequisite course is BEL005. | |
| **BEL007 Electronics (1)** | **(2L, 2T, 2P) 4 credits** |
| This course provides students with the concepts of conductors, insulators semiconductors materials and basics of electronic devices structure. The course provides the students with ability to understand the characteristics of diode and its operation theory, diode models, diode applications, special–purpose diodes. In addition, this course provides students with the concepts of BJT, JFET and MOSFET transistors and their DC biasing methods. The main teaching strategies include lecture, tutorial, practical, dialogue, discussion and project. The course pre-requisite is Electrical Circuits (1) (BEL005). | |
| **BEL008 Electronics (2)** | **(2L, 2T, 2P) 4 credits** |
| This course provides students with concepts of common electronic amplifier circuits and some linear (ICs), such as operational amplifier Op-Amp and its fundamental circuits that are required in electronic circuits design. Analyze different types of BJT amplifiers and Op-Amp circuits are presented. The course includes DC and AC analysis of common-emitter CE, common-collector CC, common-base CB and differential amplifiers. In addition, it covers the basics of Op-Amp and its characteristics, modes and parameters. The course also covers Op-Amp with negative feedback and the effects on its parameters, describe and analyze Op-Amp applications circuits, frequency response of Op-Amp and CE amplifier. The main teaching strategies include lectures, tutorials, practical, dialogue, discussion, and project. The course pre-requisites are Electrical Circuits (2) (BEL006) and Electronics (1) (BEL007). | |



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| **BEL009 Logic Design** | **(2L, 2T, 2P) 4 credits** |
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| This course is considered as an introduction to the basics of the digital design and systems. Also, it provides students the ability to understand the internal operation of the digital circuits and their design. In addition, it usually employed in digital computers, control systems, digital communications, and many other applications .<br>This course includes the number systems, logic gates, simplification methods, and design basic and simple digital circuits.<br>This course depends on lectures, tutorials, practical part, weakly homework, and a practical project that includes the most of the course's subjects. | |
| **BEL010 Microprocessors and Assembly Language** | **(2L, 2P) 3 credits** |
| This course covers many topics in Intel microprocessor (8086/8088) such as microprocessor hardware architecture, addressing modes, and instructions' set. It concerns on programming microprocessors using assembly language. The purpose of this course is to understand the microprocessor's main components, which will guide to program it correctly .<br>Understanding of this course will be enhanced by examples and practicing in microprocessor lab. The prerequisite of this course are fundamentals of logic design and Fundamentals of Computer Programming. | |
| **BEL011 Computer Programming** | **(2L, 2P) 3 credits** |
| This course provides students with a comprehensive study of structure-based programming using the C program language. This course gives a base concept of programming which can be useful to solve different engineering problems. This C programming course starts with an introduction to Computers, the Internet, and the Web and gradually progresses to the vital concepts of C programming. Programming topics include an introduction to C Programming, Structured Program Development, Program Iteration Control, Functions, Arrays, and Pointers. The course also provides practical materials to help the students to write and test their codes using a suitable programming simulation. The major teaching strategies include lectures and Laboratory works. | |
| **BEL012 Embedded Systems** | **(2L,2P) 3 credit** |
| This course covers theoretical and practical topics of Microcontrollers such as Microprocessor registers, memory, input/output ports, timers and interrupts. This course demonstrates ATMEL 8051 programming in Assembly and C languages. The purpose of this course is to design a simple control system that serves the daily life's necessities .<br>Understanding of this course will be enhanced by practicing in Microcontroller lab. The prerequisite of this course is Microprocessors and Assembly Language. | |
| **BEL013 Field Training** | **(2P) 1 credit** |
| The field-training course is designed to introduce students to the professional practice of electronic engineering programs and to provide opportunities for students to practice what they learn in real-life environments. | |



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| **BEL014 Measurements and Instrumentation** | **(2L, 2P) 3 credits** |
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| This course commences with a review of concepts and principles of basic systems of units, measurement standards and types of error in measurement. The course then covers different electrical and electronic instruments in analog and/or digital varieties (e.g. multi-meters, oscilloscopes and signal generators). Finally, transducers/sensor and signal conditioning circuit design are included. The main teaching strategies include lecture, tutorial, practical. The course pre-requisites are electrical circuits (1), electrical circuits (2) and electronics (1). | |
| **BEL015 Graduation Project (1)** | **(3L) 3 credits** |
| The graduation project provides the student a practical application of all engineering subjects. It is executed through weekly meeting of the project group with supervisor, This course contains proposal for project plane, internet literature survey, data acquisition, analysis of project theories, experimental analysis of project using available-data, and writing up a summary report about the previous stages, The supervisor will evaluate the report and give primary marks of the first semester. This course is part of fulfilment of B.Sc. requirements. Pre-requests are BUST10 and 70% of the Total C.H. | |
| **BEL016 Graduation Project (2)** | **(3L) 3 credits** |
| This course is a continuation to the graduation project-1, It is also executed through weekly meeting of project group with the supervisor, The student should introduce new theoretical analysis, or start to build project hardware (if any), or conduct new type of simulation such as ( digital or analogue computer simulation) …etc, The next stage is to test the project stuff and check its validity, then perform final measurements and obtain output results. He must establish a new conclusion about the project. The final copy of these should be completed, and reviewed by the supervisor, so to be ready for the final seminar with the project committee-exam. The supervisor will evaluate that copy and give primary mark of the second semester. This course is part of fulfilment of B.Sc. program. Pre-requests are BUST10 and 70% of the Total C.H. | |

## Compulsory Program Requirements — متطلبات البرنامج الإجبارية

| **BMT011 Hydraulic and pneumatic Systems** | **(2L,2P) 3 credits** |
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| The course will emphasize basic theory, components sizing, construction and function, how to read pneumatics and fluid power circuit diagrams using the correct symbols and troubleshooting techniques. The control of hydraulic systems and maintenance procedures are introduced. Upon completion, students should be able to understand the operation of a fluid power system, including design, application, and troubleshooting. | |
| **BMT012 Robotics** | **(2L,2P) 3 credits** |
| This course is designed to introduce students to the field of robotics. It consists of fundamental knowledge about robots including basic definitions and functions, robot types, robots' basic components, links and joints, degrees of freedom, End Effectors, kinematics, dynamics, Jacobian, Trajectory planning, open and closed loop control systems for robotic manipulators, and basics of robot's design. The teaching strategy includes lectures, practical experimentations on real robotic platform and robot simulations in MatLab and latest related packages. | |



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| **BIE004 Programmable Logic Controller** | **(2L, 2P) 3 credits** |
|---|---|
| This course is considered as fundamental concepts of programmable logic controllers. In addition, it provides students the ability to employ structured logic and flowchart design as applied to electrical, control systems, automation, and many other applications .<br>This course includes the Identify and describe major hardware/software components of a PLC-based automated control systems, link analog/digital sensors and actuators with appropriate input/output of PLC.<br>It explain the operation of programmable logic controllers; convert ladder diagrams into programs; incorporate timers and counters utilizing programmable logic controllers; and execute and evaluate programs.<br>This course depends on lectures, practical part, weakly homework, and a practical project that includes the most of the course's subjects. | |
| **BIE007 Electrical Machines (1)** | **(2L,2P) 3 credits** |
| This course introduces students to cognitive learning and develops problem solving skills with both theoretical and engineering oriented problems in the field of Electrical machines which are extensively employed in industries, power stations, domestic, and commercial appliances.<br>The course covers the basic concept of: Magnetic Circuits; Types of excitations; Electromagnetic Induction (Faraday's law); Induced emf; Single and three phase transformers; Electro mechanical Energy conversion principles; Fundamentals of electrical machines; DC Generators and Motors.<br>Course materials will be introduced through interactive lectures based on textbook, tutorials, and lab work. Students will gain simulation experience through lab sessions. The prerequisite course is BEL006. | |
| **BIE008 Electrical Machines (2)** | **(2L,2P) 3 credits** |
| Electrical machines II is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc.<br>This course covers the theory and practice in relation to single phase split phase induction motors, Capacitor start, Capacitor Run, Hysteresis motors, Shaded pole motors, Universal Motors, Synchronous reluctance motors, as well as three phase induction motors.<br>Successful completion of this course will allow students study to carry out research in the area of electrical machines design. Students will also gain simulation experience through lab sessions.<br>This course depends on lectures, practical and weakly homework that includes the most of the course's subjects. Also, it depends on computer skills and mathematics as prerequisites. | |
| **BCM010 Engineering Electromagnetic** | **(2L,2T) 3 credits** |
| This course provides students with fundamental electricity and magnetism concepts and enables them to use these concepts to develop, and design various engineering applications involving electromagnetic fields. To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures. The course topics include vector analysis, Coulomb's law and electric field intensity, electric flux density, Gauss' law, and divergence, the steady magnetic field and time-varying fields and Maxwell's equations. The course pre-requisites are Engineering Physics (BEL004) and Physics (BENG03). The main teaching strategies include lecture, tutorial and problem solving. | |



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| **BCM011 Digital Signal Processing** | **(2L,2T) 3 credits** |
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| Digital Signal Processing (DSP) is concerned with the representation of signals in digital form, and with the processing of these signals, and the information that they carry. Topics that will be covered in this course include, Discrete signals and systems, Analysis of discrete time LTI System in time domain, Convolution and Correlation, Sampling, Z-transform, Inverse Z-transform and properties, Analysis of LTI System in Z-domain, Frequency-domain characteristics of LTI System, Frequency response of LTI System, Infinite impulse response (IIR) filter design, Finite impulse response (FIR) filter design, and realization of digital filters. | |
| **BIE005 Power Electronics** | **(2L, 2P) 3 credits** |
| The course provides students with the concepts of common power electronic devices circuits that are required in power electronic circuit application design. It is provides the students with ability to analyze the different types of power control circuits. The course includes four main topics: Power semiconductor devices: Diode, Thyristors, Gate Turn-Off Thyristors , Power Bipolar Transistors, The Power MOSFET, MOS Controlled Thyristors, Single-Phase Controlled Rectifiers , Three-Phase Controlled Rectifiers, Converters & Inverters, Power Supplies, Power Electronics for Renewable Energy Sources, Drivers, Automotive Applications of Power Electronics | |
| **BIE006 Electrical Drive Circuits** | **(2L, 2P) 3 credits** |
| Electrical drives circuits is a subject where a student will deal with various types of electric drives machines which are employed in industries, power stations, domestic and commercial appliances etc .<br>This course covers basic AC/DC electric-machine drives for speed/position control. It presents an integrated discussion of electric machines, power electronics, and control systems. Computer simulations are used for understanding power-electronics based converters and the design of feedback controllers. Applications of electric drives can be found in electric transportation, robotics, process control, and energy conservation.<br>Successful completion of this course will allow students study to carry out research in the area of electrical machines drives. Students will also gain simulation experience through lab sessions.<br>This course depends on lectures, practical and weakly homework that includes the most of the course's subjects. Also, it depends on computer skills and mathematics as prerequisites. | |
| **BIE002 Modern Control Theories** | **(2L, 2P) 3 credits** |
| This course Contains detail study of modern control systems theories, as Sensitivity and Errors. Optimal Control Systems, Theories of Error-Minimization. Non-Linear Control Systems, Describing Function, State Space and Linear Systems, Transient and Steady State Response, . Stability of Non-Linear Control Systems in State Space, Liapunov Stability Criterion. Linear Programming, Controllability and Observability. Analogue Computer Simulations. Introduction to Digital Control Systems, Revision of Z-Transforms, Stability in Z-Domain, Bilinear Stability Transform. Analysis of Response-Characteristics of Digital Systems. MATLAB Applications. | |

| **BIE001 Industrial Process Control** | **(2L,2T) 3 credits** |
|---|---|
| This course provides the basic knowledge necessary for designing and implementing control strategies in process industries. Students will learn the structure and basic components of process control systems along with process dynamics, process modeling, linear and nonlinear process controllers and the multi-loops and multi-variable process control systems. Analysis of common loops such as flow control, pressure regulation, liquid level and hydraulic resonance, temperature control, etc. will be studied. The course ends with a number of important and real process control applications. | |
| **BIE003 Automatic Control Systems** | **(2L,2T) 3 credits** |
| This course aims to develop students' knowledge and understanding of automatic control systems. The course starts with an introduction to control systems and its importance to our daily life. Then, the course discusses the following topics: mathematical and graphical modeling of physical systems, basic concepts of linear control systems, the characteristics and performance of feedback control systems both in frequency domain and time domain, Routh-Hurwitz stability criterion, and the Root Locus and Bode plot techniques used in the analysis of automatic control systems. | |
| **BIE009 Digital Control Systems** | **(2L,2T) 3 credits** |
| This course provides students with the basic knowledge and skills to design, analyze and evaluate digital control systems. The course material builds on the fundamentals learned in automatic control systems. Course topics include z-transform, discrete time control systems, impulse sampling, discrete-time state space systems, modified z-transform, time-response and characteristic equations, stability, Root locus and Bode plot. In addition, the response and performance of digital control systems is analyzed using computer soft-ware (MatLAB). The teaching strategy is achieved through lectures and tutorials. | |
| **BMT003 Chemistry** | **(2L) 2 credits** |
| This course introduces basic concepts related to the main fields of chemistry such as inorganic, physical, organic, and nuclear chemistry. The concepts presented in this course are suitable for students enrolled in various electronics engineering programs. The focus in the course design has been on the inclusion of basic topics including concepts and information related to engineering disciplines. It is expected that students enrolled in this course will acquire the knowledge and skills necessary to pursue their studies in the field of specialization. Several teaching and learning activities, as well as teaching methods and assessment strategies, were chosen to enhance student learning and motivate them for further learning. | |

## Optional Program Requirements — متطلبات البرنامج الاختيارية

| **BMT007 Fluids mechanics** | **(2L,2P) 3 credits** |
|---|---|
| This course introduces the fundamentals of fluid mechanics for mechatronics engineers. It will cover the principal concepts and methods of fluid dynamics. The emphasis is on the basics of fluid statics and fluid motion, with application in a variety of engineering fields. It will describe the main concept of the fluid taking into account the velocity, pressure, the use of control volumes for fluids in motion, friction factor, boundary layer theory and all the main parameters which affect the fluid flow with its measurements. At the end of this course, students should be able to understand, analyze and compare different hydraulic engineering systems. | |



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| **BIEL03 Electrical System Protection** | **(2L, 2T, 2P) 4 credits** |
|---|---|
| Electrical Systems Protection is a subject where a student will deal with various types of power Systems switch gear & protection which are employed in industries, power stations, domestic and commercial appliances etc .<br>This course covers Basic principles – CTs, PTs, static relays, modern circuit breakers; Protection of power transformer, transmission lines, bus zone, and feeder; Protection of motors, generators and rectifiers; Relay coordination; Numerical relaying algorithms; Travelling wave relays; Adaptive relaying .<br>Successful completion of this course will allow students study to carry out research in the area of 201 Protection of Power system and Devices. Students will also gain simulation experience through lab sessions.<br>This course depends on lectures, practical and weakly homework that includes the most of the course's subjects. Also, it depends on computer skills and mathematics as prerequisites. | |
| **BCC012 Artificial Intelligence** | **(2L,2P) 3 credits** |
| This course will provide students introduction to Artificial Intelligence (AI), Soft Computing, Meta-heuristics Algorithms for solving optimization problems such as Genetic Algorithms, Artificial Neural Networks, Fuzzy Sets Theory, Fuzzy Logic, Neuro-Fuzzy Technology, Hybrid Systems and Applications of AI (three to four real life applications). Understanding of this course will be enhanced by examples using Matlab. The major teaching strategies include lectures and assignments. The course pre-requisite is Computer Programming (BEL011). | |
| **BIEL04 Industrial Safety** | **(3L ) 3 credits** |
| This course presents the fundamental concepts of industrial safety, examine the major safety management issues that affect the workplace including safety awareness, loss control, regulatory issues, and human behavior modification, also safety instrumentation and shutdown systems as well as risk assessment techniques, efficiently implementing and assessing of hazard studies, in another word the wider spectrum of industrial safety. The teaching strategy is achieved through lectures and home assignments. This course is elective. | |
| **BIEL05 Control Systems Modeling and Simulation** | **(2L, 2P) 3 credits** |
| Simulation is the process of designing a model for a system, and conducting experiments to understand its behavior, or evaluate various tests-results for the operation of the system. Modeling & Simulation (M&S) has become an important tool in all phases of the data acquisition process, and can be used within all life cycle phases, including requirements analysis, concept exploration & evaluation, design & development, integration and test-evaluation, and production & sustainment. This introduction to M&S for systems engineers focuses on understanding the principles of simulation and how models and simulations are utilized to plane and design real engineering systems. | |
| **BIEL01 Engineering Management** | **(3L) 3 credits** |
| This course provides a basic understanding of modern management by examining concepts and theories. Emphasis is placed on studying applied management principles to technological based organizations. Topics will focus on functions of management, management philosophies, organization structures and cultures, globalization, strategic management and ethics. This course depends on lectures, examples, and weekly homework. No prerequisite courses is needed. | |



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| **BIEL02 Electronic Designs** | **(2L, 2P) 3 credits** |
|---|---|
| This course provides the basic concepts of electronic design. It provides students the ability to analysis & syntheses several electronic systems such as power supply, oscillators and Timers. The course includes the types of voltage regulators, their protection circuits, over load circuits, types of oscillators & their application in practical circuits.<br>This course depends on lectures, practical part, weakly homework, and a practical project that includes the most of the course's subjects, The course pre-requisites are electrical circuits(1), electrical circuits(2) , electronics(1), electronics(2) and electronics(3). | |
| **BCML07 Digital Image Processing** | **(2L, 2P) 3 credits** |
| This course introduces the basic concepts, methodologies, and applications of digital image processing. The topics to be covered are digital image fundamentals: representation, sampling, and quantization, image acquisition, basic relationships between pixels, imaging geometry; image enhancement: in the spatial domain and in the frequency domain, image smoothing and sharpening; image restoration; image segmentation: detection of discontinuities, thresholding, region-oriented segmentation. Understanding of this course will be enhanced by examples using Matlab. The major teaching strategies include lectures and assignments. The course pre-requisite is Signals and Systems (BEL003). | |

**L**=Lecture, **T**=Tutorial, **P**=Practical



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