REPUBLIC OF YEMEN

UNIVERSITY OF *SCIENCE & TECHNOLOGY*

Faculty of Engineering

الجُمهـوريّـةِ اليَمنِيّـةِ

جَامِعَةُ العُلـومِ والتكنولوجِيـا

كلية الهندســــة

Course Descriptions	وصـف المقـــــررات

| **Department:** Electronics Engineering | **القسم:** الهندسة الإلكترونية |
| **Program:** Bachelor of Mechatronics Engineering | **البرنامج:** بكالوريوس هندسة الميكاترونكس |

University Requirements	متطلبات الجامعة

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.

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:
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.

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.

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.

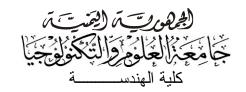| Faculty Requirements	متطلبات الكلية

BENG01 Mathematics	(2L, 2T) 3 credits

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.

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BENG02 Engineering Drawing	(3L) 3 credits

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.
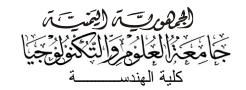
BENG06 Engineering Mechanics	(2L, 2T) 3 credits

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.

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

BEL001 Differential Equations	**(2L, 2T) 3 credits**

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**

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).
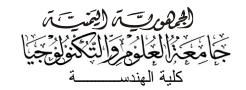
BEL008 Electronics (2)	**(2L, 2T, 2P) 4 credits**

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

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 .

This course includes the number systems, logic gates, simplification methods, and design basic and simple digital circuits.

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 .

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 .

Understanding of this course will be enhanced by practicing in Microcontroller lab. The prerequisite of this course is Microprocessors and Assembly Language.
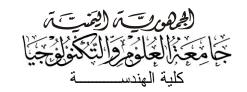
BEL013 Field Training	(2P) 1 credit

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**

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

BMT001 Engineering Workshop	**(2P) 1 credits**

   Introductory to principles of production, Function and planning of workshop, Industrial safety, Measurements, electrical circuits and its installation, Carpentry tools, Engineering materials, Metal machining, joining of materials, Sheet metal work, Metal forming; Bench work and filling, Foundry and pattern making
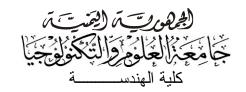
BMT002 Machine theory	**(2L,2P) 3 credits**

Theory of Machines is that branch of Engineering-science, which deals with the study of relative motion between the various parts of a machine and forces which act on them. The knowledge of this subject is very essential for an engineer in designing the various parts of a machine. Theory of Machines may be sub-divided into kinematics, kinetics, dynamics, and statics. Students will learn simple mechanisms, computer simulation of various machine mechanisms, velocity in mechanisms, and acceleration in mechanisms, cams, static force analysis of mechanisms, dynamic force analysis of mechanisms, gear trains and balancing of rotating masses.

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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.

BMT004 Thermodynamics and Heat Transfer	(2L2T) 3 credits

This is a simple course in Thermodynamics and Heat Transfer covering main topics that might help the students in their practical lives. The course will cover energy analysis, energy transfer as work and heat, the laws of thermodynamics will be taken into account. The processes of heat transfer: Conduction, Convection and Radiation will be covered with detailed numerical problems. The course will also focus on the solutions of steady flows

BMT005 Properties and Strength of Materials	(2L,2T) 3 credits

Understand the basic concepts and techniques of strength of materials as well as common mechanical properties of materials with emphasis on the application of these to the solution of suitable problems in mechanical engineering design via properties and strength of materials (factor of safety, standards and design equations). The main topics concern: axial stress and strain; shear, torsion; shear and moment diagrams; beam stresses; combined stresses; stress and strain transformations; Mohr's circle; combined loading and static failure theories.

BMT006 Systems Dynamics and Vibrations	(2L,2T) 3 credits

System dynamic vibration describes the motion of the body in the state of oscillation. Students will learn fundamentals of vibration, harmonic motions, free vibrations of damped and un-damped one-degree-of-freedom systems, response of first order systems and time constant, Rayleigh's energy method, forced vibrations, harmonic excitation, response of un-damped and damped systems under harmonic force and under rotating unbalance, vibration under general forcing conditions, equations of motions for forced vibration of two-degree-of-freedom systems, vibration control, balancing of rotating machines, whirling of rotating shafts, vibration isolation.

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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BMT008 Power Electronics and Drives	(2L,2T,2P) 4 credits

This course is prepared to provide students with the principle concepts in the field of power electronics and drives as enabling technologies. It gives students the skills in the definitions, analysis, and solving problems related to power semiconductor devices and drive circuits. The course enables students to discuss the basic topologies of power switching devices, rectifiers, AC voltage controllers, DC choppers, and voltage-fed inverters with special emphasis on application of devices and current industrial practice and to identify commonly employed electric motor drives and their methods speed control with special emphasis on Computer simulations are used for understanding electric drives based power-electronics converters and the design of feedback controllers.

BMT009 Design of machine Elements	(2L,2P) 3 credits

Design of Machine Elements is important step of machine design. Machine Design is the creation of planes for a device to perform the desired functions. This course will integrate the knowledge and principles learned in statics, dynamics, properties and strength of materials into the analysis, selection and design process of specific machine elements. Students will learn the fundamentals of the design process, simple stresses in machine elements, static failure theories, variable stresses in machine parts, metal fits and tolerances, element design: Power screws, bolted joints, keys, pins, splines, shafts, couplings, gears, belts, bearings, and design projects.

BMT010 Mechatronics systems design	(2L,2T) 3 credits

This course provides students with the knowledge and skills to the integrated design process of mechatronics systems. Students will learn the operational characteristics of mechatronics systems components such as sensors, actuators, controllers, and real-time computer interfacing devices and how to combine these components into sophisticated products demanded by the marketplace. They will also learn about modelling approaches of mechatronics systems, components selection and sizing, and the inclusion of various considerations into a quantifying justified design.

BMT011 Hydraulic and pneumatic Systems	(2L,2P) 3 credits

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.
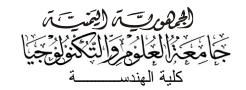
BMT012 Robotics	(2L,2P) 3 credits

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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BMT013 Selected topics in Mechatronics	(2L,2P) 3 credits

This course provides students with conceptual and fundamental understanding in three main areas in mechatronics: computer aided design and manufacturing, smart and intelligent sensors, and advanced control schemes applied to mechatronics systems. In the first area students will learn the role of computer in designing and manufacturing processes, manual as well as automatic programming of computer controlled machines. In the two following areas students will learn the structure, principle of working, and types of intelligent sensors, in addition to various advanced control schemes such as feedforward, cascade, ratio, split-range, and override control and their applicability to mechatronics systems. Laboratory experiments on real equipment or computer simulations are arranged to reinforce the material studied in class.

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.

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 .

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.

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.

This course depends on lectures, practical part, weakly homework, and a practical project that includes the most of the course's subjects.

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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.

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.

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.

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.

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.

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.

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 software (MatLAB). The teaching strategy is achieved through lectures and tutorials.

Optional Program Requirements	متطلبات البرنامج الاختيارية

BIEL03 Electrical System Protection	(2L, 2P) 3 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.

This course covers Basic principles – Current and Voltage Transformers (CTs and VTs), 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.

Successful completion of this course will allow students to gain worth knowledge about various types of protection systems and carry out research in the area of protection of power system and devices. Students will also gain simulation experience through lab sessions.

This course depends on lectures, practical and weakly homework that includes the most of the course's subjects. In addition, it depends on Electrical Machines (2) as prerequisite.

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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.

BMTL01 Manufacturing process	(3L)3 credits

This course provides an introductory study of manufacturing processes including interrelationships between the properties of the material and the manufacturing process under the classification of processing operations and the basic parameters involved in these processes. It covered the selection criteria for manufacturing processes, castings, bulk deformation process, sheet metal working, powder metallurgy, machining processes and the parameters surrounding manufacturing processes, machinery, and operations that influence design considerations, product quality, and production costs.

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).

BMTL02 Mechanical Drawing	(2L, 2T) 3 credits

This course is designed to enable the student to draw an assembly drawing of Machines then draw the detail working drawing of any needed part to be manufactured, as well as how to use documents and International Standard. The course will cover assembly, detailed drawings, geometric dimensioning and tolerance. The Machine Drawing course will incorporate computer graphics to facilitate the student in design and presentation considerations of machine parts.
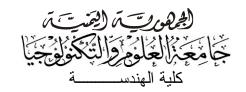
BMTL03 Control Systems Design	(2L, 2P) 3 credits

This course provide students with fundamental knowledge and understanding of control system design methods. Students are assumed to have a knowledge of linear control systems and basics of digital control systems. Course topics include: control system design based on Root-locus and Bode plots, Nyquist design procedures, multivariable control systems design and state space analysis and design. Practical experiments in Control lab will allow students to reinforce the material learned in the class.

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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.

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, signal conditioning, data/signal switching, transmitting, interfacing, synchronizing. In addition, it covers oscillators and timers. The course includes the most common of voltage regulators and their protection circuits, interface digital/analog circuits and sensors, analog-to-digital and digital-to-analog conversion circuits, pulse width modulators and drivers, types of oscillators and timers & their application.

   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 Electronics (2).

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