الجامعة الإماراتية الدولية

كلية الهندسة وتكنولوجيا المعلومات

برنامج هندسة المعدات الطبية

وصف المقررات الدراسية

Courses Description

المستـــــــــــــــــوى الاول

الفصل الدراسي الأول

C.H.	L.	T.	P.	لغة عربية I (UNI 103)
2	2			

يهدف هذا المقرر إلى تزويد الطلبة بالمهارات اللغوية التي يحتاجونها في حياتهم العلمية والعملية، ويتناول مهارات الاستماع والقراءة والتحدث والكتابة، وأهم الأسس النحوية والإملائية. وتركز موضوعاته على الدور الوظيفي لهذه المهارات من دون الدخول في تفاصيل القضايا النحوية واللغوية، فاهتم بمرتكزات كل مهارة، وتدريب الطلاب على اكتسابها بما يمكنهم من استخدامها استخداما يخلو من الأخطاء اللغوية والنحوية والإملائية.

C.H.	L.	T.	P.	لغة انجليزية I (UNI 105)
2	2			

This course is a skill-based course that focuses on elementary skills of listening, speaking, reading and writing. The course is a pre-requisite for the English 102. It develops students' language skills and competencies by exposing them to a variety of short general and academic contexts at the beginner level. In addition, the course builds the students' basic vocabulary and grammar structures that enable them to communicate orally and in writing in limited contexts. Interactive exercises and tasks will be encouraged in order to strengthen students' confidence in using English.

C.H.	L.	T.	P.	الثقافة الإسلامية (UNI101)
2	2			

C.H.	L.	T.	P.	الصراع العربي الإسرائيلي (UNI107)
2	2			

C.H.	L.	T.	P.	مقدمة في الحاسوب (UNI109)
3	2		2	

The aim of this course is to give student the fundamentals of computer. It focuses on introduction to computer topics with an emphasis on learning about computer, operating systems, application software, Internet, and applying software using MS Office. The course helps student to learn about the importance of computers and how to use computers.

C.H.	L.	T.	P.	رياضيات 1 (EIT111)
3	2	2	-	

This course aims to get students acquainted with basic concepts of differential calculus and its various applications in science and engineering. Course topics cover real numbers, inequalities, absolute value, exponential and logarithmic functions, limits and continuity, differentiation rules, derivatives of trigonometric functions and their inverses and the

derivatives of exponential and logarithmic functions. The course focuses as well on the applications of differential calculus including: curve sketching, relative and absolute extrema, Rolle's theorem, mean-value theorem, related rates, applied maximum and minimum problems, applications in business and economics., applications of exponential and logarithmic functions.

C.H.	L.	T.	P.	
3	2		2	فيزياء هندسية (BIO121)

Engineering physics is both a foundation and a framework for most of the branches of engineering. The main objective of this course is to provide students with fundamental concepts/theories and skills in physics that offer them a solid base for studying various engineering disciplines. Course topics will include units and dimensions, vectors analysis, linear, curvilinear and rotational motions, Newton's mechanic and it applications, fluids, work-energy principles, wave principles, the properties of matter such as elasticity, viscosity and continuity, heat transfer as well as the essential electrical concepts and laws. The course will include laboratory experiments that emphasize problem-solving, laboratory investigation and applications.

C.H.	L.	T.	P.	
3	2	2		ميكانيكا هندسية –استاتيكا (BIO141)

The overall purpose of this course is to introduce the concepts, principles and methods of Engineering Mechanics: Statics applied to determine the magnitude and nature of forces involved in various joints and muscles of the musculoskeletal system. Course topics will include: force vector, moment and torque, equilibrium of systems and applications of statics in biological systems. The course provides students the basic knowledge for help to improves human performance in the workplace, designs medical equipment and artificial replacements and implants.

الفصل الدراسي الثاني

C.H.	L.	T.	P.	
3	2	2	-	رياضيات 2 (EIT112)

This course aims to get students acquainted with basic concepts of definite and indefinite integrals and to assist them in using various techniques to evaluate integrals, and realize integration applications in life. Course topics include: integration of elementary functions, definite integrals: sigma notation – fundamental theorem of calculus – properties of definite integrals – the mean value theorem for integrals, integration techniques: integration by parts – integration by partial fractions – trigonometric substitution – integrating power of trigonometric functions, numerical integration: trapezoidal rule and Simpson's rule. In addition, applications of integration in engineering and physics are introduced such as the calculation of: area, volume, arc length, centre of mass, moments, …etc.

C.H.	L.	T.	P.	
2	2	-	-	لغة انجليزية II (UNI 106)

This course builds on what students have learned in English 101. It provides more practice and learning experiences for students to develop their elementary skills of listening, speaking, reading and writing. In addition, the course builds the students' ability in the language use through equipping them with a wide range of vocabulary, grammatical structures and expressions relevant to general and academic contexts by exposing them to a variety of short general and academic texts and conversations at the elementary level. More learner-centered activities will be emphasized to enhance students' independent learning.

C.H.	L.	T.	P.	لغة عربية II (UNI 104)
2	2			

يتناول هذا المقرر مهارات الكتابة الإبداعية والوظيفية بهدف تعميق قدرات الطلاب على الكتابة وطرائق استخدامها في حياتهم العلمية والعملية، من خلال التعليم والتدريب على تجاوز المشكلات الكتابية في بيئة تعمل على تنمية التفكير الناقد وأساليب الإبداع، وما ينبغي أن يتحقق من دقة التعبير الكتابي وأساليبه على المستويين الوظيفي والإبداعي، ويساعد على اكتساب المعرفة وبناء الوعي الثقافي بأهمية الكتابة الصحيحة وتنمية مهاراتها.

C.H.	L.	T.	P.	الثقافة الوطنية (UNI102)
2	2	-	-	

C.H.	L.	T.	P.	مقدمة في الهندسة الطبية الحيوية (BIO172)
2	2	-	-	

Introduction to biomedical engineering course aims to introduce students to the various branches of traditional of biomedical engineering (BME) such as clinical engineering, biomechanics, biomaterials and biocompatibility, and cell and tissue engineering. The course will cover an overview of: BME definitions, jobs of BME graduates, careers areas of BME, BME ethics and morals, historical perspective of BME, biomedical signals acquisition and processing, biomedical sensors, biomechanics, biomaterials, clinical engineering, various imaging techniques, and electrical safety of medical equipment. The course focuses on during is placed on rising self-learning as well as quantitative and analytical problem-solving skills.

C.H.	L.	T.	P.	دوائر كهربائية 1 (BIO130)
4	2	2	2	

The course offers a comprehensive knowledge about DC circuits analysis and it is considered to be the foundation course for biomedical engineers. Course Topics; Electrical variables: voltage, current, power and energy; Electric circuit elements: Sources, R, L & C; Circuits topologies: series, parallel & series-parallel networks; Basic laws: Ohm's, KVL, KCL; Circuit analysis techniques: Nodal, Mesh, Y-to-delta and delta-to-y conversions; Network theorems: Thevenin's, Norton's, superposition, and maximum power transfer; Transient response of first-order networks. Through interactive lectures based on textbook, lab work. Students will learn how to design and simulate electric networks practically and using simulations tools such as Multisim and MATLAB.

C.H.	L.	T.	P.	رسم هندسي (CIV125)
2	-	-	4	

This course introduces students of biomedical engineering to engineering drawings and the required skills for communicating information through engineering drawings. Students learn the techniques of graphical communication and standard practices of manual technical drawing. Course topics include: geometric construction, methods of projection, free hand sketching, dimensioning and orthogonal projection, missing views, pictorial projection and sectional viewing. In addition, students will be introduced to the use of computer aided drafting tools. They will be taught the basic skills necessary to complete dimensioned drawings in AutoCAD including setting up a drawing, basic lines and coordinates, geometric shapes, layering, editing commands, dimensioning, hatching and plotting to scale.

C.H.	L.	T.	P.	ميكانيكا هندسية – ديناميكا (BIO142)
3	2	2	-	

The dynamics course is a branch of engineering mechanics concerning the study of the movement under the action of external forces and how forces interact to affect motion. Students will learn how to apply Newton's laws to rectilinear and curvilinear motion problems. Topics include kinematics of particles, continuous and erratic rectilinear motion, curvilinear motion, rectangular components, normal and tangential components, motion of projectiles, absolute and relative motion analysis of two particles, force and acceleration, work-energy concepts, impulse and momentum and plane kinematics of rigid bodies. The tutorials sessions allow students to apply the theoretical concepts to real-life problems.

المستـــــــــــــــــوى الثاني

الفصل الدراسي الأول

C.H.	L.	T.	P.	رياضيات 3 - الجبر الخطي (MEC221)
3	2	2	-	

This course aims to introduce students to the main principles to linear algebra and coordinate systems, as well as their applications in solving mathematical issues in science and engineering. The course covers Cartesian, cylindrical and spherical coordinate systems, systems of linear equations; matrices; linear transformations and determinants; eigenvalues; eigenvectors; orthonormal bases; orthogonal matrices and Gram-Schmidt Algorithm. The course focuses on a specific applications for linear algebra in biomedical engineering.

C.H.	L.	T.	P.	دوائر كهربائية 2 (BIO231)
4	2	2	2	

This course aims to provide students with the fundamentals, calculations and analysis of single phase and three phase Alternating Current Circuits (AC), to enhance their theoretical knowledge and practical skills related to AC circuits practicing in the field of biomedical engineering. Course Topics includes: complex numbers, phasors, Sinusoidal signals measures and phasors; impedance & admittance, Power in AC circuit: apparent power, active, reactive, power triangle, and power factor; Three Phase balanced AC circuits: three phase EMF generation, phase sequence, delta and star connection. Throughout lab experiments, group-based course projects, and computer simulation, students develop their skills related to AC circuits analysis.

C.H.	L.	T.	P.	برمجة حاسوب (BIO251)
3	2	-	2	

This course aims to provide the basic concepts and principles related to computer programming using python language, and applications to the field of biomedical engineering. Topics include, an introduction to python language - python variables, basic operators, and blocks, numeric and string data types, defining list and list slicing, use of tuple data type - Program control flow: conditional blocks using if, else and elif, simple for loops, for loop using ranges, string, list and dictionaries, while loops, loop manipulation using pass, continue, break and else - Functions, modules, and packages: reusability concept with functions and organizing projects with modules and packages - String, List And Dictionary Manipulations - File manipulation - Regular Expressions - Introduction to Object-Oriented Programming (OOP) - Exception handling - Introduction to database interaction. Throughout practical Lab experiments & computer-based lab work as well as, course project work, students will reflect & develop their learned skills in the python programming language.

C.H.	L.	T.	P.	ميكانيكا حيوية (BIO243)
2	2	-	-	

This course aims to understand the principles of rigid and deformable body mechanics extensively applied to a large range of biological tissues including bone, articular cartilage, and skeletal muscle. Topics include concepts of stresses, strains, mechanical and viscoelasticity properties of biomaterials, uniaxially loaded bars, circular shafts under torsion, bending and shearing of beams, two-dimensional stress transformations, and principal stresses. In this course, students learn how to analyze the human body as a mechanical system with examples from the tissue level to the whole-body

level. Furthermore, the mechanical behavior of connective tissues such as tendons and ligaments are commonly modeled using strain energy density functions.

C.H.	L.	T.	P.	علم الأحياء العامة (BIO261)
3	2	-	2	

A coherent introductory course, that comes from different disciplines and brought together to provide the students with the fundamental concepts, principles, and theories of biology, so that the student acquires a comprehensive idea of life characteristics, macromolecules (carbohydrates, proteins, lipids, and nucleic acids), cell structure, cell membrane (transportation), as well as cell division (meiosis and mitosis), and cell signaling. Emphasizing anatomy and physiology biology from zoological perspectives, basic concepts of genetics are also included and finally, maintenance of homeostasis is discussed, all will allow the students to acquire knowledge of biological principles relevant to further studies.

C.H.	L.	T.	P.	تصميم نظم منطقية (BIO235)
3	2	-	2	

This introductory course in logic systems design aims to introduce fundamental concepts and theories of logic systems, as well as the procedural design methodologies of logic systems' units. Digital systems have become as a prominent requirement in several engineering systems including: biomedical, industrial, and marketing system. The course covers, an introduction to digital systems and signals, systems' numbers, basic logic gates, Boolean algebra, several combinational logic circuits design, and an introduction to sequential logic circuits. Beside theoretical lectures, logic lab works are carried to improve the practical skills of students. In addition, students will work in groups for preparing course project for solving some field problems using real framework and simulation.

C.H.	L.	T.	P.	الكترونيات 1 (BIO233)
4	2	2	2	

This course presents fundamental principles and concepts of electronic devices and their applications in the design and construction of electronic circuits for solving practical problems in biomedical engineering. Course covers the main principles of formatting semiconductor devices, such as Diodes and Bipolar Junction Transistors (BJT). Also focus on formation of the different types of the Field Effect Transistors (FET) & their DC/AC analyses. Laboratory experiments and MATLAB simulation work are carried for different types of analog electronic elements to verify the theoretical concepts and to develop problem-solving skills related to electronic circuits and systems design and implementation.

الفصل الدراسي الثاني

C.H.	L.	T.	P.	رياضيات 4 – تطبيقات الرياضيات الهندسية (MEC222)
3	2	2	-	

This course aims to introduce students to the main principles to differential equations and integral transformations, as well as their applications in solving mathematical issues in science and engineering. The course covers classification, formation and solutions of ordinary differential equations with the geometric and physical applications, Laplace transform; properties and applications; solutions of differential equations using Laplace transform, Fourier series; Fourier transform and Orthogonal Functions. The course focuses on a specific applications for differential equations and integral transforms in biomedical engineering.

C.H.	L.	T.	P.	الكترونيات 2 (BIO234)
4	2	2	2	

This course provides students the concepts, theories and practical skills to be applied to the design & implementation of electronics2, to meet higher requirements of electronics systems as an essential-part to different biomedical arrangement & devices, automation & control systems, and smart devices. Course topics include: Amplifier frequency response, amplifiers and filters, bio – potential amplifiers, design of power system in medical electronics, oscillator circuits, analog and to digital converter (ADC), and digital to analog converter (DAC). Through hands-on practical & computer-based labs works, students will verify the learned theoretical concepts and develop their problem-solving & design skills related to electronics systems based on real platforms and simulation environments.

C.H.	L.	T.	P.	الإحصاء والاحتمالات (EIT210)
3	2	-	2	

This course aims to provide students with the fundamental knowledge and understanding of the probability theory and statistical analysis. Course topics include types of data, graphs and representation, measures of central tendency and variation, correlation and regression, the principles of probability theory, some types of famous distributions such as Z- distribution, Student t distribution and Chi-Square distribution. In addition, the course focuses on conducting and interpreting statistical experiments using popular statistics packages such as Excel, SAS, SPS or MATLAB.

C.H.	L.	T.	P.	اجهزة طبية وقياسات (BIO245)
3	2	-	2	

The objective of biomedical instruments and measurements course is to give students the knowledge of the principle of operation and design of several biomedical instruments, theories and techniques for electronic measurements on physiological systems. The course covers main topics of systems for measuring bio-signals including cardiovascular system and measurements, respiratory system, patient monitoring instruments, and clinical laboratory instruments. The course focuses on practical design experience working in groups, and discussion of ethical and regulatory issues related to bioinstrumentation.

C.H.	L.	T.	P.	علم وظائف الأعضاء (BIO262)
3	2	-	2	

Physiology familiarizes students with basic definitions and principles related to physiology. The course emphasizes the concept of internal environment and homeostasis and the concept of feedback in a biological system. It also helps

students to understand body fluid and cellular physiology. The course gives an overview on the physiology and functions of blood, cardiovascular, respiratory, endocrine, digestive s and renal systems. It prepares student to understand future disease process and pathophysiology.				
C.H.	**L.**	**T.**	**P.**	**الإنجليزي التقني (EIT213)**
2	2	-	-	
This is an English for Specific Purpose (ESP) course for engineering and IT students. The course aimed to give students the specialized technical language, information, and skills needed for their program of study. It presents them with the appropriate English from a variety of technological, engineering and industrial fields. This course also enables students to produce organized reports, formal letters/emails, CVs that conform to technical format/style, audience, vocabulary, grammar and the use of graphics where appropriate.				
C.H.	**L.**	**T.**	**P.**	**كيمياء حيوية (BIO264)**
3	2	-	2	
Biochemistry course focuses on structure, composition, classification, and importance of biomolecules such as carbohydrates. Lipids, proteins, nucleic acids, vitamins and enzymes that provides students with basic information of biochemistry that has made vital contributions to medical devices.				

المستـــــــــــــــــوى الثالث

الفصل الدراسي الأول

C.H.	L.	T.	P.	حساسات طبية ومجسات (BIO347)
3	2	-	2	

The objective of biomedical sensors & transducers course is to give the student knowledge of acquisition approaches of bio-signal, and kinds of sensors & transducers that are used in measurement. The course will cover circuits and sensors used to measure physiological systems. Topics will also include transducers of temperature, displacement, pressure, photoelectric, flow, biochemical, and biopotential electrodes. In addition to chemoreceptor, biosensors, and wireless sensor interfaces. The corequisite laboratory will focus on the practical implementation of electronic devices for biomedical measurements.

C.H.	L.	T.	P.	اجهزة طبية 1 (BIO371)
3	2	-	2	

The course aims to provide basic concepts, operating principles, and block diagrams of several medical laboratory equipment. The students would be learned the skills for analyze, repair, maintenance, and troubleshooting as well as using maintenance, test, and calibration tools. The course includes: An introduction to analytical instruments and bio-analysis devices, design of instrumental analysis, spectrophotometer, colorimeter, flame photometer, blood cell counter, blood gas analyzer, and bio-chemistry analyzer. The course focuses on practical activities related to operating, calibrations, troubleshooting, and maintenance of medical laboratory equipment.

C.H.	L.	T.	P.	الات كهربائية (BIO339)
3	2	-	2	

This course provides students with the principal concepts of electrical machines. The course topics includes electromechanical energy conversion (EMEC) principles; the construction, classification, performance characteristics and analysis of electrical machines, parallel operation, testing and applications of: single and three-phase transformers, DC machines, special machines, single and three-phase synchronous and asynchronous AC machines as well as the starting and speed control of different types of motors. Laboratory experiments are carried out for different types of machines to verify the theoretical studied concepts.

C.H.	L.	T.	P.	نظم تحكم تماثلي (BIO349)
3	2	-	2	

The Analog Control Systems course aims to give the student knowledge of the basic concepts and Theories of modeling, development, analysis, design and implement of analog control systems. This includes feedback control systems – dynamics characteristics – mathematical modeling and analysis of control systems using transfer function model and state variable model – block diagrams reduction and signal flow graphs – characteristics and performance of feedback control systems – transient response analysis – stability analysis – Root-Locus method – PID controllers – Frequency response method - Logarithmic plots – Bode diagram method –series and feedback compensation - state space design methods – controllability and observability – design of linear feedback control systems – linear time varying state models – pole placement design method – observer design method – and transfer function of controller. The course focuses on practical activities related to analysis, design, and implement the analog control systems.

C.H.	L.	T.	P.	معالجة الاشارات الحيوية (BIO353)
3	2	-	2	

The biomedical signals processing course aims to give the student knowledge of the Signal representation: Continuous-time and Discrete-time signals, overview of analog and discrete-time signals properties, Fourier analysis, and time-frequency analysis. Then study discrete-time filter, the Z-transform, and sampling. The convolution theorem for the Fourier and z-transform will be presented. Next, Various estimation, detection and filtering methods are developed and demonstrated on biomedical signals and application on EEG-ECG signals are introduced in detail. Throughout Computer-based lab graduates will develop their programming skills related to the development of algorithms for biomedical signal processing.

C.H.	L.	T.	P.	معالجات دقيقة ومتحكمات (BIO337)
3	2	-	2	

This course aims to provide the basic concepts and principles related to microprocessors and microcontrollers architectures, programming, and applications to the field of biomedical engineering. The MP/MC play the main processing & control unit in different biomedical instrument. Topics include, an introduction to MP/MC architectures, differences and applications, the 8086/8088-Mps internal architecture & IC interfacing, assembly programming, and an introduction to the 8051-MC interfacing, features, and assembly programming. Throughout practical Lab experiments & computer-based lab work as well as, course project work, students will reflect & develop their learned skills in the design, simulation, programming and implementation of real-world applications related to the MP/MC based systems.

C.H.	L.	T.	P.	أساسيات البحث العلمي (EIT410)
2	2	-	-	

The course aims to introduce students to the basic concepts and issues of quantitative and qualitative scientific research. Students will learn the nature and tools of research, the basic components of research process, formulating research questions, research design, elements of analysis research papers, data collection and analysis, conceptualization and measurement, building evidence, research evaluation, documentation and presentation. By the end of the course students submit and present a research course-project on a topic assigned by the course instructor.

الفصل الدراسي الثاني

C.H.	L.	T.	P.	نظم تحكم رقمي (BIO348)
3	2	-	2	

The Digital Control Systems course aims to give the student knowledge of the basic concepts and Theories of modeling, development, analysis, design and implement of modern and digital control systems. This course includes the basic principles of digital control systems, quantization and quantization errors, data acquisitions, Z-transform and its applications to solve difference equations, Z plane analysis for discrete time control systems, impulse sampling, pulse transfer function, PID digital controllers realization and implementation, mapping between continuous –time control systems and discrete-time control systems, stability analysis, transient and steady state response, conventional and modern design methods of digital control systems, root-locus and bode plot design methods, analytical design methods, state space representation, controllability, observability, and servo-controllers. The practical part allows students to practice different digital control approaches studied in theoretical classes.

C.H.	L.	T.	P.	الكترونيات قوي (BIO336)
3	2	-	2	

This course provides students the concepts, theories and practical skills to be applied to the design & implementation of power electronics and drivers, to meet higher requirements of power electronics systems as an essential-part to different biomedical arrangement & devices, automation & control systems, and smart devices. Course topics include: introductory switching devices, devices for power electronics, and converter design and simulation. Basic concepts of DC-DC converters in continuous and discontinuous modes are included, DC- AC inverter along with design for motor drives. Laboratory experiments and MATLB simulation tool will be carried for different types of power electronics elements to verify the theoretical concepts related to power electronics devices practicing.

C.H.	L.	T.	P.	اجهزة طبية 2 (BIO374)
3	2	-	2	

The course aims to introduce students the basic concepts, operating principles, and block diagrams of a variety of medical devices which are used in in deferent departments in hospital such as emergency, operation rooms, intensive care units and etc. . The students would be learned the skills for analyze, repair, maintenance, and troubleshooting as well as using maintenance, test, and calibration tools. The course includes: ventilator, anesthesia, patient monitor, defibrillator, electrosurgical devices, infusion pumps, and syringe pumps. The course focuses on practical activities related to operating, calibrations, troubleshooting, and maintenance of such equipment.

C.H.	L.	T.	P.	هندسة إكلينيكية (BIO376)
3	2	2	-	

The clinical engineering course aims to equip students with engineering and clinical knowledge, the major concepts, the role of the clinical engineer in any hospital, life cycle management of medical equipment, understanding of safety controls in equipment operation, and the quality for the healthcare facilities. The course covers biomedical technology assessment, and the regulations to ensure the correct and safe use of biomedical technologies. The course focuses essentially on applying biomedical engineering principles, systems, and management to technology being planned for or existing in the healthcare system.

C.H.	L.	T.	P.	الأنظمة المدمجة والواجهات (BIO338)
3	2	-	2	

This course will provide students with the knowledge and concepts of embedded systems and interfacing. Students will learn how to interface sensors, actuators, different input/output devices, microcontrollers, data acquisition hardware and instrumentation buses, various types of interfacing software tools to develop typical embedded systems. In addition, the laboratory exercises will allow students to integrate software and hardware components to implement real-time embedded systems applications using assembly/MicroC programming language. By the end of this course, students will be able to specify suitable embedded systems for a given task, create a suitable software perception for it and select necessary tools and test environments.

C.H.	L.	T.	P.	مواد حيوية (BIO244)
2	2	-	-	

This course is designed to provide a fundamental knowledge of materials that are commonly utilized in engineering and biomedical field specifically. Various types of materials currently being utilized for biomedical applications and their structures, properties and biocompatibility with references to the biological environments will be discussed.

C.H.	L.	T.	P.	ريادة أعمال ومهارات تواصل (EIT212)
2	2	-	-	

Communication skills are essential to a successful career in Engineering. This communication course for the engineering and it students will enable them to develop the ability to communicate efficiently in English, orally as well as in written, within the field of engineering. Students will also train and develop interpersonal skills such as contributing to discussions, making presentations, reading and synthesizing information, writing reports and working effectively with colleagues and other professionals in the engineering field.

C.H.	L.	T.	P.	التدريب الحقلي (BIO380)
-	-	-	-	

Field training aims to expose students to a non-academic environment within which they apply the knowledge gained via traditional coursework. Field training is conducted within a particular time frame in either a governmental facility or private organization such as local hospitals, community clinics, public health agencies, related healthcare industries, research laboratories, and pharmacies. It enables students to engage in authentic, purposeful, partnered, supervised and assessed work learning experiences through which they develop practical, professional and interpersonal skills and connect to the latest technologies and protocols being used by important and relevant healthcare centres. During field training period, students are required to always observe the rules and regulations and record daily activities in the provided records/log books. By the end of training, each student will submit a full report containing detailed description of the work carried out by him/her. Faculty's staff will monitor the student performance during the training sessions to assess the trainee attitude and the suitability of the training programme.

المستـــــــــــــــــــــوى الرابع

الفصل الدراسي الأول

C.H.	L.	T.	P.	مشروع تخرج 1 (BIO481)
2	2	-	-	

The undergraduate project is a two-term design project conducted by every student in the last two terms before graduation. It emphasizes student's ability to convert the theoretical knowledge and practical experience learned previously into practical engineering design practice and/or research project. Graduation project I module described here allows students to exercise their creativity and problem-solving skills using project based learning and exercising teamwork. Under the guidance of faculty members, students are divided into groups of 3-6 students and develop skills in planning and managing projects, reviewing literature, defining and implementing engineering solutions, evaluating safety and health regulations and communicating significant knowledge. They will investigate a specified problem, explore possible solutions and build a prototype design. At the end of the semester, student teams are required to deliver oral presentations for examination and submit written end-of-semester report.

C.H.	L.	T.	P.	الامان في الاجهزة الطبية (BIO477)
3	2	-	2	

The safety of biomedical engineering course explains the students to the methods and practices needed to identify and manage applicable safety requirements in a polluted environment. Students will learn how to achieve optimum safety and health conditions in microbial, radiation or risky environments due to electrical wiring and other unsafe equipment. The course cover: basic definitions, biomedical hazard recognition, electrical & patient safety, fire safety, radiation safety, laser and ultraviolet (UV) radiation safety, laboratory safety, infection control and prevention, biomedical hazard control, biomedical waste management, and regulatory requirement for healthcare and medical device.

C.H.	L.	T.	P.	نظم التصوير الطبي 1 (BIO475)
3	2	-	2	

The medical imaging system 1 course aims to give the student knowledge of the basic concepts of Theory operations, calibrations and maintenance for medical imaging equipment, the block diagrams for a variety medical imaging equipment which used in radiology department, design instruments to satisfy specific needs, develop skills for analyze, calibration, repair, maintenance, and troubleshooting of medical imaging systems. This course includes the X-ray machine, C-arm, Mammography, fluoroscopy. Methods of obtaining useful medical images, Image formation and display. Projection radiography. Radiation detectors. Automating diagnosis and non-invasive testing. Radiation safety of patients and personnel, and types of digital detectors using in above machines. The co-requisite practical will focus on the practical operations, calibrations, troubleshooting and maintenance for medical imaging equipment.

C.H.	L.	T.	P.	صيانة الاجهزة الطبية (BIO479)
3	2	-	2	

The course aims to introduce students the methods, types of maintenance for medical equipment, and maintenance strategy. The students learn the logical approaches to troubleshooting. Hence, the student's ability to deal with the malfunctions, repair, and calibration will be increased. The course covers the main topics including: an introduction to

maintenance management, fundamentals of troubleshooting, maintenance and calibration for several equipment in laboratory, medication delivery systems and aspirators devices, sterilizing, infant care, patient monitoring systems, diagnostic, cardiology, respiratory care, and medical imaging equipment.				
C.H.	**L.**	**T.**	**P.**	**الذكاء الاصطناعي (BIO455)**
3	2	-	2	
The course aims to help student understanding concepts of artificial intelligence in order to solve various problems in different fields. The course focus on Problem representation and reduction, Search techniques and Heuristics, Reasoning and the rules of inference, Learning and Machine Learning, methodology of Science in Learning, Applications of intelligent information systems, Advanced topics in Artificial intelligence such as fuzzy logic, genetic algorithms and neural networks.				
C.H.	**L.**	**T.**	**P.**	**مقرر اختياري 1**
2	2	-	-	

الفصل الدراسي الثاني

C.H.	L.	T.	P.	مشروع تخرج 2 (BIO482)
2	2	-	-	

Graduation Project-II allows students to employ their acquired knowledge to finalize and implement the proposed design in Graduation Project-I. In this module, students finalize the design work, integrate components, evaluate the system prototype and apply appropriate error detection and corrections techniques to ensure that the project meets the requirements set in the initial project plan. The project supervisor will ensure that students maintain ethical issues and documentation formats, develop presentation and communication skills and use proper referencing and checking plagiarism. At the end of the project, students will produce a runnable developed system in real time along with the final version of project report. The project assessment is accomplished through a committee assigned by the department.

C.H.	L.	T.	P.	معالجة الصور الطبية (BIO456)
3	2	-	2	

This course aims to introduce basic concepts, theories, and techniques used in medical image processing. Digital image processing has a wide range of applications in biomedical systems, such as medical imaging systems like MRI and City-Scans. The course covers, an introduction to digital image processing and its biomedical applications, digital image representations, simple operations on images, image Enhancement (in time & frequency domains), Images morphologic & restoration, image segmentation, and image compression. Consequently, students will develop their programming skills related to image processing through working in computer-based lab with MATLAB or Python programming for performing different processing on images. In addition, course-project will be carried for development of algorithms that solves practice problems of biomedical imaging systems.

C.H.	L.	T.	P.	نظم التصوير الطبي 2 (BIO478)
3	2	-	2	

The medical imaging systems 2 course aims to give the student knowledge of the basic concepts of Theory operations, calibrations and maintenance for medical imaging equipment, the block diagrams for a variety medical imaging equipment which used in radiology department, design instruments to satisfy specific needs, develop skills for analyze, calibration, repair, maintenance, and troubleshooting of medical imaging systems. This course includes the Medical ultrasound imaging (US), Computed Tomography (CT), Magnetic Resonance Imaging (MRI). Methods of obtaining useful medical images, Image formation and display. Projection radiography. Radiation detectors. Automating diagnosis and non-invasive testing. Radiation safety of patients and personnel, and types of digital detectors using in above machines. The co-requisite practical will focus on the practical operations, calibrations, troubleshooting and maintenance for medical imaging equipment.

C.H.	L.	T.	P.	إدارة المشاريع الهندسية (CIV470)
3	2	2	-	

This course aims to provide students with basic knowledge for managing resources and scheduling, tracking and controlling and completing project within the specific constraints and deadlines. The course will focus on product life cycles, managing, planning, designing and controlling projects, human and logistics resources, systems' maintenance & reliability, industrial safety constraints, tools and techniques of quality cost. Students will develop skills in preparing feasibility studies and identifying elements for a success development of engineering projects.

C.H.	L.	T.	P.	مقرر اختياري 2
2	2	-	-	

المقـــــررات الاختياريـــــة في البرنـــــــامج

C.H.	L.	T.	P.	هندسة وإدارة المستشفيات (ELC491)
2	2	-	-	

The hospital engineering & management course pursues to describes the main concepts of hospital management and the biomedical engineer role on it. Initiate students the knowledge about the classification, structure, and designing hospitals. The course covers variety of main topics, including: hospital planning and design, classification of hospital & modern hospital architecture, design of hospital departments (intensive care units, operations, emergency, and radiology department), and systems (medical gases network, ventilation, and electrical power). In addition to information system, and medical equipment management. The course focuses on discussion the hospital design aspects from the biomedical engineer's point of view.

C.H.	L.	T.	P.	العلاج الإشعاعي والطب النووي (ELC493)
2	2	-	-	

The nuclear medicine techniques course aims to give the student knowledge of basic physics concepts, theories of radiotherapy and nuclear medicine, principles of radioactivity and their applications in radiotherapy, and nuclear medicine and interaction of radiation with human body. The course includes the principles of gamma camera, SPECT, PET and linear acceleration. In addition to, methods of obtaining useful images, image formation and display, radiation safety, and the types of detectors using in such machines.

C.H.	L.	T.	P.	هندسة الخلايا والأنسجة (ELC495)
2	2	-	-	

The course aims to introduce the students the basic knowledge of cell and tissue engineering, including the definitions, concepts, principals, latest developments, the category of cell and tissue engineering, biomaterials, fabrication of scaffolds, the use of stem cells and exemplars of tissue engineering in the context of biology and regenerative medicine. In addition to key technologies used in tissue engineering, and its applications. The course covers major topics including introduction to cell and tissue engineering, cell structure and cellular processes, fundamentals of tissue engineering, the basis of growth and differentiation, enabling technologies, biomaterials in tissue engineering, and tissue engineering applications.

C.H.	L.	T.	P.	مبادئ وتطبيقات الروبوتات في الهندسة الطبية الحيوية (ELC492)
2	2	-	-	

The evolution of robotics in medical applications is an exciting development and has become the central core of medical-engineering collaboration. This course aims to provide relevant knowledge in the field of medical robotics, both in terms of the contemporary use of important medical robots and the mathematical and computational theory behind them. The course starts by introducing the fundamental robotics principles such as kinematics, Jacobian, dynamics, trajectory planning and control. Then, the design and control of robots and associated technology for medical applications are highlighted, with a focus on surgery, rehabilitation and intervention.

C.H.	L.	T.	P.	نظم الإدارة وتقديم الرعاية الصحية (ELC494)
2	2	-	-	

The Management Systems and Healthcare Delivery course aims to give the student knowledge of the basic concepts of the total quality management and project cycle management in hospital, the medical gases networks, the methods applied to measure, test, evaluate and design the medical gases network. The course includes the Project Cycle Management (PCM), Total Quality Management (TQM), 5S principle, Kaizen principle, continuous quality improvement, introduction of medical gases network, design of medical gases network, medical gases and its applications, medical gas pipe line system, components of medical gases network, medical gases plants, testing of medical gases networks.

C.H.	L.	T.	P.	المعلوماتية الحيوية (ELC496)
2	2	-	-	

The Bioinformatics course aims to give the student knowledge of the basic concepts and theoretical background knowledge of the bioinformatics and techniques employed in bioinformatics. Emphasis will be placed on biological sequence (DNA, RNA, protein) analysis and its applications. The course includes the analyzing individual DNA, RNA and protein sequences, using mainstream web-based bioinformatics tools, evaluate data sources and choose the correct paths to solutions, searching databases, using sophisticated software, and interpreting results.