

University of Mosul
جامعة الموصل
College of Science
كلية العلوم
Medical Physics Department
قسم الفيزياء الطبية



First Cycle – Bachelor's degree (B.Sc.) – Medical Physics

بكالوريوس علوم - علوم الفيزياء الطبية



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1. Overview

This catalogue is about the courses (modules) given by the program of Department of Medical Physics to gain the Bachelor of Science degree. The program delivers (48) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج علوم الفيزياء الطبية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (40) مادة دراسية، مع (6000) إجمال ساعات حمل الطالب و (240) إجمال وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1			
Code	Course/Module Title	ECTS	Semester
MPH-1101	Electricity and magnetism	8.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	95	105
Description			
<p>Clarification of how electricity and magnetism can make significant contributions to a wide range of scientific problems in medical physics sciences. This course deals with the basic concept of electricity and magnetism . Learn about the relations of electricity with magnetism and the medical applications of such relation.To understand and comprehend the impact of electricity and magnetism on medical physics sciences .To perform different electricity and magnetism applications. At the end of the course the students will have broad knowledgeOf the basic concepts , technique and application of electricity and magnetism. This will be achieved through, theoretical lectures, tutorials and laboratory</p>			

Module 2			
Code	Course/Module Title	ECTS	Semester
MPH-1102	Analytical chemistry	8.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	95	105
Description			
<p>1. Clarification of how analytical chemistry can make significant contributions to in chemistry science .</p>			

2. Identify –volumetric analysis which are useful in chemistry-.
3. This course deals with the basic concept of the most important calibration standardization and blank corrections and this module.
4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic.
5. To understand the impact of these Neutralization titration. Precipitation titration --- Oxidation – reduction titration Complex formation reaction in -- volumetric analysis
6. To perform different applications of quantitative analysis and qualitative analysis -.

Module 3			
Code	Course/Module Title	ECTS	Semester
SCI-101	Mathematics 1	2.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	34	16
Description			
<ol style="list-style-type: none"> 1- Understanding basic concepts: Students should develop a solid understanding of fundamental concepts in calculus, such as limits, continuity, derivatives, and integrals. 2- Calculating derivatives: Students should be able to calculate derivatives using various differentiation techniques, including the power rule, chain rule, product rule, quotient rule, and trigonometric derivatives. 3- Applying differentiation: Students should be able to apply differentiation to solve problems related to rates of change, optimization, curve sketching, related rates, and applied problems in various fields. 4- Understanding the Fundamental Theorem of Calculus: Students should comprehend the Fundamental Theorem of Calculus and be able to use it to evaluate definite integrals and find antiderivatives. 5- Solving differential equations: Students should gain an understanding of basic techniques for solving first-order differential equations and solving separable, linear, and homogeneous differential equations. 6- Multivariable calculus: Depending on the level of the course, students may be introduced to multivariable calculus and learn concepts such as partial derivatives, multiple integrals, and vector calculus. 			

Module 4			
Code	Course/Module Title	ECTS	Semester
MPH-1103	General biology 1	8.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	95	105
Description			
<p>7. Clarification of how biology can make significant contributions to a other science in life.</p> <p>8. Identify cell , organisms- which are useful in life.</p> <p>9. This course deals with the basic concept of the most important organisms aspects of this module.</p> <p>10. Learn about the most important scientific terms (cell) and their definitions related to this topic.</p> <p>11. To understand the impact of these types of cells in level of organisms.</p> <p>12. To perform different medical biology applications.</p>			

Module 5			
Code	Course/Module Title	ECTS	Semester
UOM-101	Arabic language	2.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	34	16
Description			
<p>تعريف الطلاب بأساسيات اللغة الإنجليزية. كذلك كسر حاجز الخجل وزيادة ثقتهم داخل وخارج الفصل. هناك فرصة كبيرة لإشراكهم في مناقشات قصيرة حيث يمكنهم الكتابة أو التعبير عن أنفسهم شفهيًا. بالإضافة إلى ما سبق ، ستعمل الدورة على تحسين مهارات القراءة والكتابة والاستماع والتحدث كطلاب ، وتقوية ملكة الطلاب الأدبية لتذوق أساليب اللغة وإدراك مواطن الجمال فيها</p>			

Module 6

Code	Course/Module Title	ECTS	Semester
UOM-104	Human right and democracy	2.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	34	16

Description

أ - المعرفة والفهم (الأهداف المعرفية)

- أ-1 ان يكون الطالب ملماً بمفاهيم حقوق الانسان والديمقراطية ويكتسب الوعي والثقافة السياسية.
- أ-2 يستطيع ان يميز بين المصطلحات والمفاهيم المختلفة مثل (حقوق الانسان، الديمقراطية، الانتقال الديمقراطي، العدالة الانتقالية).
- أ-3 القدرة على تحليل تطورات حقوق الانسان والمراحل التي مرت بها.
- أ-4 ان يكون قادراً على ادراك واستيعاب الاعلانات والمواثيق الدولية لحقوق الانسان مثل الاعلان العالمي لحقوق الانسان.
- أ-5 ان يكون قادراً على التعبير عن راية بخصوص واحترام آراء الآخرين .
- أ-6 ان تكون لديه القدرة على تحليل اي مشكلة ووصفها والتنبأ بمستقبل الظاهرة السياسية .
- أ-7 ان يتعرف على انواع الديمقراطية والتميز فيما بينها داخل النظم السياسية المعاصرة.
- ب - المهارات الخاصة بالموضوع (الأهداف المهاراتية الخاصة بالمقرر)
- ب – 1 اكتساب الطالب لمهارات التفاوض والتواصل وتبادل الآراء مع الآخرين.
- ب – 2 اكتساب الطالب مهارات الحوار البناء الهادف .
- ب – 3 اكتساب الطالب مهارات مواجهة اي موقف والتعبير عن الراي بكل شجاعة وثقة بالنفس.
- ج- مهارات التفكير
- ج-1 مهارات التحليل.
- ج-2 مهارات التوظيف للمفردات التي تعلمها في الواقع العملي من خلال دراسة مشكلات محددة من الواقع.
- ج-3 مهارات التنبؤ والدراسات المستقبلية للنظم الديمقراطية.
- د - المهارات العامة والمنقولة (المهارات الأخرى المتعلقة بقابلية التوظيف والتطور الشخصي).
- د-1 القدرة على العمل كفريق.
- د-2 التفاعل مع فريق العمل لتحقيق المهارات المطلوبة.
- د-3 القدرة على القيام بعرض نظري لبعض الموضوعات ذات العلاقة بمفردات المادة.
- د-4 اكتساب مهارات التحليل العلمي لاي ظاهرة سياسية تتعلق بحقوق الانسان.

Module 7			
Code	Course/Module Title	ECTS	Semester
MPH-1204	Mechanics	6.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>The course aims to develop their analytical, problem-solving, and critical- thinking skills in the context of mechanics.</p> <p>Learning Outcomes:</p> <ol style="list-style-type: none"> 1. Knowledge and Understanding: Students should be able to demonstrate a deep understanding of the fundamental concepts, laws, and theories of classical mechanics, including Newton's laws of motion, conservation of energy and momentum, and rotational motion. 2. Problem Solving: Students should be able to apply the principles of mechanics to solve a wide range of problems, including kinematics, dynamics, and statics, using mathematical techniques and appropriate physical models. 3. Experimental Skills: Students should be familiar with experimental methods commonly used in mechanics and be able to design and conduct experiments, analyze data, and draw meaningful conclusions. 4. Mathematical Skills: Students should have a strong foundation in mathematical techniques, such as calculus and vector algebra, necessary for the analysis and formulation of mechanics problems. 5. Critical Thinking: Students should be able to critically evaluate physical phenomena, interpret experimental results, and make connections between different concepts in mechanics. 6. Communication: Students should be able to effectively communicate their ideas, methodologies, and findings, both in written form and through oral presentations, using appropriate scientific terminology. 			

Module 8			
Code	Course/Module Title	ECTS	Semester
MPH-1215	Mathematics 2	6.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	0	79	71
Description			
<p>Giving an introduction to transcendental and hyperbolic functions, topics of integrations and their applications.</p> <ol style="list-style-type: none"> 2. The student learns how to solve related mathematical problems through applying the laws given to him. 3. Applied examples and several issues were taken, which the student stopped solving in the middle school stage. 4. Developing the concept and new derivation methods and studying many types of functions and their behavior 5. Developing the concept of integration and finding various ways to integrate complex functions and difficult to integrate in the usual ways. 			

Module 9			
Code	Course/Module Title	ECTS	Semester
MPH-1216	General biology 2	6.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<ol style="list-style-type: none"> 1. Clarification of how living cell and organisms can work and function smoothly. 2. Identify the cell structure and components. 3. Clarification the functions of each component of the living cell and how different cells, organs, and systems work together as a whole organism. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. <p>To understand the impact of Biology in medical physics study and application.</p>			

Module 10			
Code	Course/Module Title	ECTS	Semester
UOM-103	Computer Science	3	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
0	3	48	27
Description			
<ol style="list-style-type: none"> 1. To develop problem solving skills and understanding of Microsoft Word. 2. This course deals with the basic concept of Word. 3. To understand how writing and printing on computer. 4. To perform different application with word such as MATLAB. 			

Module 11			
Code	Course/Module Title	ECTS	Semester
UOM-102	English language	2.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	0	34	16
Description			
Familiarizing students with the basics of the English language. Also, breaking the barrier of shyness and increasing their confidence inside and outside the classroom. There is a big chance to get them engaged in short discussions where they can write or verbally express themselves. In addition to these above, the course will improve their reading, writing, listening and speaking skills as students where English language is the main medium of communication throughout their courses.			

Module 12			
Code	Course/Module Title	ECTS	Semester
MPH-1217	Organic chemistry	7.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	94	81
Description			
<ol style="list-style-type: none"> 1. Clarification of how hydrocarbons can make significant contributions to in chemistry science . 2. Identify hydrocarbons and IUPAC Nomenclature of alkane , alkenes and alkynes which are useful in chemistry-. 3. This course deals with the basic concept of the most important preparation of alkane , alkene and alkynes and this modulare. 			

4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic.
5. To understand the impact of these Uses of alkenes and alkynes and isomerism . in chemistry
6. To perform different applications of properties of saturated and un saturated hydrocarbons .

Module 13

Code	Course/Module Title	ECTS	Semester
MPH-2308	Biophysics	6.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
Biophysics is the scientific field concerned with studying the methods and theories of physics to understand how vital systems work, study how different parts of the cell move and their functions, and study complex systems in our bodies and their complexity such as the brain, blood circulation, digestive system, and more.			

Module 14

Code	Course/Module Title	ECTS	Semester
MPH-2319	Optics	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

5	5	79	71
Description			
<ol style="list-style-type: none"> 1. Study the hypotheses and theories that studied the nature of light and the phenomena that explained it, with the important knowledge such as the electromagnetic spectrum. 2. Identify the importance of studying the geometrical law of light such as reflection and refraction to understand how the light transmit in the medium. 3. Learn about the most important scientific terms (Terminology) and their definitions related to this topic, such as RADIOMETRY. 4. This course deals with the basic concept of light by its law: Huygens' principle, Fermat's principle. 5. Discuss the impact of the imaging by an optical system. 6. Understand and comprehend the optical instrumentation, such as the Camera, and Microscopes. 7. To understand the wave equation, and superposition of waves. 8. At the end of the course the students will have broad knowledge of the basic concepts, technique and applications of biophysics. This will be achieved through, theoretical lectures, tutorials and laboratory. 			

Module 15			
Code	Course/Module Title	ECTS	Semester
MPH-23010	Atomic Physics	6.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Atomic physics is intended to be used with two - semester courses for student who have already had basic physics and calculus courses .Relativity and quantum ideas are considered first to provide a framework for understanding the physics of atoms and nuclei . The theory of atom is then developed with emphasis on quantum - mechanical notions . Next comes a discussion of the properties of aggregates of atoms , which includes a look at statistical mechanics . Finally atomic nuclei and elementary particles are examined .</p>			

Module 16			
Code	Course/Module Title	ECTS	Semester
MPH-23111	Phsiology	5.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	46
Description			
<ol style="list-style-type: none"> 1. Clarification of how physiology can make significant contributions to a 2. Identify the basic of cell and human physiology which are useful in in medical physics sciences. 3. This course deals with the basic concept of the most important cell as living units of the body, molecular movement and cell ,body fluid , cell junction and locomotion. 4. Learn about the most important scientific human physiology of number of body systems. 5. To understand the relationship between body organs. 6. Emphasizing the importance of maintaining a healthy body and preventing disease caused by imbalance in the function of the organs of the body <p>This will be achieved through, theoretical lectures, tutorials and laboratory</p>			

Module 17

Code	Course/Module Title	ECTS	Semester
MPH-23112	Electromagnetic waves	5.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		63	62
Description			
<ol style="list-style-type: none">1. Modeling and analysis: The module aims to provide a comprehensive understanding of electromagnetic fields and their behavior within a particular system or device. It allows engineers and scientists to create mathematical models and simulations to study the behavior of electromagnetic waves, currents, and fields.2. Design optimization: The electromagnetic module can assist in optimizing the design of electromagnetic devices, such as antennas, sensors, motors, transformers, and circuits. By simulating the electromagnetic behavior, engineers can refine the design parameters and improve the efficiency, performance, and reliability of these devices.3. Electromagnetic compatibility (EMC): The module helps in assessing electromagnetic compatibility issues, ensuring that different electronic systems can operate without interfering with each other. It analyzes electromagnetic interference (EMI) and electromagnetic susceptibility (EMS) to identify potential problems and propose solutions for reducing interference and improving system reliability.4. Signal integrity analysis: In the field of high-speed electronics, the electromagnetic module aids in analyzing signal integrity issues that can arise due to electromagnetic effects, such as crosstalk, reflections, and transmission line effects. By simulating the behavior of signals in complex electronic circuits, engineers can optimize the design to minimize signal degradation and improve performance.5. Antenna design and analysis: Electromagnetic modules are often used for designing and analyzing antennas, including their radiation patterns, impedance matching, and gain. The aim is to optimize the antenna's performance for specific applications, such as wireless communication, radar systems, and satellite communication.6. Material characterization: Electromagnetic modules can also be used to characterize the electromagnetic properties of materials, such as conductivity, permittivity, and permeability. This information is crucial for designing electromagnetic devices and understanding their interactions with different materials. <p>Overall, the aim of an electromagnetic module is to provide engineers and scientists with powerful tools for understanding, analyzing, and optimizing electromagnetic phenomena in various systems and devices.</p>			

Module 18			
Code	Course/Module Title	ECTS	Semester
U0M-201	Crimes of Baath Party	2.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	34	16
Description			
This section includes a description of the module, 100-150 words			

Module 19			
Code	Course/Module Title	ECTS	Semester
MPH-24013	Medical imaging	6.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Explain how to use physical techniques in medical imaging that have wide applications in the field and specialization of medical physics. This course deals with the basic concept of medical imaging. Learn about the relationship of physical techniques in the medical field and the mechanism of understanding the work of ideas and physical concepts of this relationship, to know the impact of physical properties, including penetration, reflection and dispersion of these techniques on medical physics sciences, to perform medical imaging applications of all kinds. At the end of the course students will have a broad knowledge of the basic concepts, technique and application of the physical properties of these techniques in medicine. This will be achieved through theoretical lectures and lessons.</p>			

Module 20			
Code	Course/Module Title	ECTS	Semester
MPH-24114	Molecular Biology	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	46
Description			
<p>The module seeks to understand how molecular biology can make significant contributions to a wide range of scientific benefits in medical physics sciences. This course deals with the basic concept of nucleic acids in molecular biology. Learn about the most fundamental concepts of important topics in modern biology such as gene functions and genetic disorder and related diseases. Moreover, the module tries to understand and comprehend the impact of molecular biology processes on medical physics science. At the end of this course, students should be able to demonstrate a clear understanding of the facts and basic concepts of molecular biology which are covered in lectures. This will be achieved through, theoretical lectures, tutorials and laboratory</p>			

Module 21			
Code	Course/Module Title	ECTS	Semester
MPH-24115	Bioelectronics	6.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	71
Description			
<p>Bioelectronics, as introduced in this course, involves the application of electronic engineering principles to biology, medicine, and the health sciences. An important aspect of bioelectronics is the development of a communication interface between biological materials (cells, tissue and organs) and electronic components.</p>			

This course introduces the biochemical, biophysical and physiological concepts that are of relevance to bioelectronics, it also provides instruction in the basic science and engineering concepts required to understand the design and application of biosensors.

Biosensors are defined as self-contained integrated devices capable of providing analytical information using a biological recognition element in conjunction with a secondary transduction element. Different biosensor systems are explored, ranging from electrochemical devices, through to optical or thermal systems. Instruction is also given in the general principles of sampling and analysis, statistical presentation and manipulation of data acquired by biosensors.

Finally this course examines the methods used to interface sensors for biological and biomedical applications with electronics. One focus will be on transducers, meaning devices which convert information from one form of energy to another. In this course the final form for the information will be an electrical signal but the transducers themselves could be optical, mechanical, etc., and operate in a number of different ways (eg., capacitive, potentiometric, photonic).

This introductory course provides background that will be of particular use for the Semester 2 lab-on-a-chip technologies course.

Demonstrate knowledge of the industrial and socioeconomic context of bioelectronics and biosensor development and their markets. Understand the basic physico-chemical properties of proteins and DNA, and the physiological properties of membranes, cells, tissues and some organs, together with an appreciation of the relationship between structure and function.

Understand the distinction between the passive and active electrical properties of membranes, along with the origins of electrical signals emanating from the brain (electroencephalography) and heart (electrocardiogram). Design and use bioelectrodes, and understand the concept of transduction and methods of extracting information from bioelectronic-sensors and electrochemical biosensors.

Understand the basic principles of biosensing in terms of biological, chemical and optical/photonic responses.

Demonstrate knowledge of the general principles of sampling and analysis, statistical presentation and manipulation of data generated by biosensors.

Analyse sensor outputs through the use of analogue circuit concepts. Understand typical electronic instrumentation for biosensors and important concepts such as calibration and references.

Module 22			
Code	Course/Module Title	ECTS	Semester
MPH-24016	Health Culture	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	48	27
Description			
<p>تحديد مفهوم الثقافة الصحية تحديدا دقيقا. التعرف على سبل تحقيق الثقافة الصحية للمجتمع. التعرف على الامراض المعدية وغير المعدية التي تصيب الانسان. تصنيف الامراض التي تصيب الانسان. التعرف على اهم مجالات صحة البيئة وعلاقتها بصحة الفرد. التعرف على العلاقة بين صحة الغذاء مع صحة الفرد. التعرف على الاسعافات الاولية الضرورية للاصابات المختلفة. التعرف على اهم التقنيات الطبية الحديثة في تشخيص الامراض. التعرف على انماط السلوك الصحي الصحيح والخاطئ</p>			

Module 23			
Code	Course/Module Title	ECTS	Semester
MPH-24017	Heat and Thermodynamic	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	79	46
Description			
<p>1. The aim of studying thermodynamics - as the name indicates - is the branch of physics which is study of the relationship between properties of heat, temperature, energy, and work. Central to that relationship and to the laws of thermodynamics are the concepts of entropy and the Internal Energy Formula.</p> <p>13. Understand how thermal energy is stored or generated.</p> <p>14. Knowledge of the main laws on which the science of thermodynamics depends, namely the Zero Law (or the Fourth Law), the First Law, the Second Law, and the Third Law.</p> <p>15. Studying the relationship between heat and mechanical motion, as in the invention of the steam engine and the gasoline engine, and ways to raise their efficiency.</p> <p>Understanding and studying the generation of electric power from several means such as coal-fired plants, hydroelectric power or nuclear energy, all of these technologies depend on their development in order to raise their efficiency in the science of thermodynamics.</p>			

Module 24			
Code	Course/Module Title	ECTS	Semester
MPH-24118	Phonetics Science	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	48	77
Description			
<ol style="list-style-type: none"> 1. Clarification of how sound and wave motion can make significant and contribute to a wide range of technical applications. 2. Identify basic of sound and wave motion. 3. This course deals with the basic concept of the most important elements in wave motion such as Free Vibration, structure of simple harmonic motions and Embedded vibration 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand and comprehend the impact of these elements from Physics point of view. 6. To understand the applications of ultrasound in medical fields 			

Module 25			
Code	Course/Module Title	ECTS	Semester
MPH-35019	Medical Physics 1	5	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	3	79	46
Description			
<p>Introduction to medical physics, Nature and effects of ionizing radiation on biomolecules structures, living cells and tissues. Genetic effects and methods of radiation protection. Radiobiological implications of diagnostic and therapeutic radiation , Medical physics principles underlying medical imaging and discusses the interaction of different kinds of radiation with biological matter.. Modalities covered: x-rays, computed tomography, nuclear medicine, ultra-sound, and magnetic resonance imaging. and positron emission tomography .</p> <p>Topics include signal generation, detection and the associated mathematics to produce medically useful images, and factors affecting resolution and sensitivity. Relevant radiotherapy methods include the gamma knife, brachytherapy, and proton-beam therapy. Important & Principles of biomedical applications - C.T.scan – ultra .sonography. NMR</p>			

Module 26			
Code	Course/Module Title	ECTS	Semester
MPH-35120	Anatomy	5	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	3	79	46
Description			

The course aims to provide the student with a complete understanding of the basics of human anatomy and anatomical nomenclature; also, to provide adequate information about the complete structure of cells, tissues, organs and systems in the human body. The course aims to inform the student with the normal structure and appearance of the different anatomical regions of the human body to be able to understand the basic aspects of medical physics related to the functions of the human body parts. Also, helps the student to identify the normal and abnormal human body structure and shapes that help in understanding the principle of examination by medical imaging techniques in the diagnosis of human disorders. In addition to, helps the student to use the knowledge in the anatomical structure and physiological function to understand the images obtained by the different radiographic imaging techniques, such as X-rays or tomography diagnostic imaging; so that the student will become a competent medical physicist member and active aid in the specialist staff of the medical facilities.

Module 27			
Code	Course/Module Title	ECTS	Semester
MPH-35021	Biostatics	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	1.5	79	21
Description			
The purpose of the course is to teach fundamental concepts and techniques of descriptive and inferential statistics with applications in health care, medicine, public health, and epidemiology. Basic statistics, including probability, descriptive statistics, inference for means and proportions, and regression methods are presented. The analytic methods and applications will be linked to topics including health promotion, epidemiology, and program evaluation			

Module 28			
Code	Course/Module Title	ECTS	Semester
MPH-35122	Physics of Diagnostic radiology	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
6	4	94	56
Description			
<ol style="list-style-type: none"> 1. Study the fundamentals of radiation and radioactivity. 2. Identify the importance of studying radiation and its effects on the matter and tissue. 3. This course deals with the basic concept of radiation, radiation protection and how the image generate. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic, such as radiology. 5. To perform different radiation applications to diagnostic different disease. 6. To perform and develop new techniques for diagnosing machine. For example: x-ray, CT scan. 7. At the end of the course the students will have broad knowledge of the basic concepts, technique and applications of radiation. This will be achieved through, theoretical lectures, tutorials and laboratory. 			

Module 29			
Code	Course/Module Title	ECTS	Semester
MPH-35123	Laser Basics	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
6	4	94	56
Description			
<ul style="list-style-type: none"> - To understand Einstein coefficients and relations, and light amplification. - To identify the laser gain medium and pumping mechanisms. - To understand three-level and four-level laser systems. - To clarify laser rate equations and laser threshold. - To clarify the absorption and gain in homogeneous mediums. - To apply and solve math problems related to optical resonances and laser modes. - To understand laser radiation properties. - To classify the types of laser outputs. - To classify laser types. - To understand Q-switching and tunable operation - To understand the solid-state lasers. - To understand the semiconductor lasers. - To understand the dye and excimer lasers. - To understand the gas lasers. 			

Module 30			
Code	Course/Module Title	ECTS	Semester
MPH-35024	Elective course 1	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3	48	52
Description			
<p>Medical Immunology: The study of medical immunology is an important field in the medical and biological sciences, this course shows how medical immunology can contribute to solving a wide range of scientific problems in the field of medical physics. This course also deals with clarifying the basic concept of medical immunology and identifying the relationships of immunology with medical applications. In addition to understanding the role of immunology in developing methods and adding new immunological applications to medical physics. At the end of the course, students will have a broad knowledge of the basic medical concepts, techniques, and applications of immunology. This will be achieved through theoretical lectures, lessons, scientific visits, and other extracurricular activities.</p> <p>Medical Bacteriology:</p> <ol style="list-style-type: none"> 1. Clarification of how bacteria are important in our ecosystem and our bodies. 2. Illustration of bacterial cell structure and components. 3. Clarification of the basic bacterial virulence factors and their role in the pathogenesis. 4. Learn about the most important bacterial diseases for human and their causative agents and symptoms. 5. To understand and learn about the transmission routes, diagnosis, treatment and prevention of bacterial diseases infecting humans. <p>Medical Parasitology: Understand the concept of parasitism and parasite Identify the types of medical parasites Calcification of medical parasites Learn about the types of hosts Learn how parasites are transmitted to humans</p>			

Types of parasites that infect human body systems

Diagnosis of parasites

Clinical symptoms of parasitic diseases

Treating parasitic diseases

Methods of prevention of parasitic diseases

Method of diagnosis of parasites disease

Genes and Diseases

The module seeks to understand how genes and diseases can make significant contributions to a wide range of scientific benefits in medical physics sciences. This course deals with the basic concept of genes and related inherit diseases. Learn about the most fundamental concepts of important topics in genes and diseases such as genes disorder, type and causes and related diseases. Moreover, the module tries to understand and comprehend the impact of genes and diseases processes on medical physics science. At the end of this course, students should be able to demonstrate a clear understanding of the facts and basic concepts of genes and diseases which are covered in lectures. This will be achieved through, theoretical lectures, tutorials and seminars.

Module 31			
Code	Course/Module Title	ECTS	Semester
MPH-36125	Medical Terminology	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3.5	48	52
Description			
This course is aimed to increase students' knowledge in terms of different vocabulary, phrases, clauses and medical physics-related terminology. It enables the learners to express what they would like to communicate while they are still studying at college or even when they get their potential jobs. Also, this course encourages the learners to read books, articles and browse department-related websites to search for information needed.			

Module 32			
Code	Course/Module Title	ECTS	Semester
MPH-36126	Biochemistry	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	3	79	46
Description			
This module aims to provide the student with an overview of metabolic pathways and an understanding of the ways in which metabolic processes are regulated. The associated practical work aims to give hands-on experience of enzyme assays at the laboratory bench. Associated data handling aims to provide tuition in handling calculations essential for basic enzyme analysis			

Module 33			
Code	Course/Module Title	ECTS	Semester
MPH-36027	Physics of nuclear medicine	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	5	79	71
Description			
Introducing the students to the basics of nuclear physics. Classification of radiation. Ionizing and nonionizing radiation. Classification of ionizing radiation.			

Radioactivity, Alpha Decay. Beta decay. Gamma decay. Nuclear binding energy. Nuclear fusion and fission. Photon interactions with matter. Exponential absorption of photon beam in absorber. Radiobiology. Radiation effects and time scales. Molecular effects of radiation and their modifiers. DNA damage and repair. Cellular effects of radiation. Concept of cell death. Cell survival curves. Gross radiation effects on tumors and tissues/organs. Basic principles of radiation protection.

Module 34			
Code	Course/Module Title	ECTS	Semester
MPH-36128	Medical laser applications	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	5	79	71
Description			
<ul style="list-style-type: none"> - To understand laser-tissue interaction. - To classify the medical lasers. - To identify the relation between absorption and laser spectrum wavelengths - To understand the advantages and disadvantages of laser therapies. - To clarify laser surgery in dermatology. - To clarify the laser eye surgery - To clarify the laser application in dentistry. - To understand general laser medical applications. - To learn how to use laser safety eyewear. - To understand and know the laser hazards and caution labels. 			

Module 35			
Code	Course/Module Title	ECTS	Semester
MPH-36129	Analoge electronics	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	3	79	46
Description			
<ol style="list-style-type: none"> 1. Clarification of how analog electronics can make significant contributions to a wide range of technical applications. 2. Identify circuit elements n details. 3. This course deals with the basic concept of the most important elements in electronics such as diodes, zener diodes and transistors amplifiers 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand and comprehend the impact of these elements from Physics point of view. . 			

Module 36			
Code	Course/Module Title	ECTS	Semester
MPH-36030	Elective course 2	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3.5	48	52
Description			

Cellular and genetic disorders:

The study of Cellular and genetic disorders is an important field in the medical and biological science, this course shows how can contribute to solving a wide range of scientific problems in the field of medical physics. This course also deals with clarifying the basic concept of medical and biological instruments and identifying the relationships and applications in medicine and biological field. In addition to understanding the role of this instruments in developing methods and adding new applications to medical physics. At the end of the course, students will have a broad knowledge of the basic medical concepts, techniques, and applications of this instruments. This will be achieved through theoretical lectures, lessons, scientific visits, and other extracurricular activities.

Medical Plants and Toxicology:

1. Clarification of how biology can make significant contributions to a other science in life.
2. Identify cell , organisms- which are useful in life.
3. This course deals with the basic concept of the most important organisms aspects of this module.
4. Learn about the most important scientific terms (cell) and their definitions related to this topic.
5. To understand the impact of these types of cells in level of organisms.
6. To perform different medical biology applications.

Medical Laboratory analysis:

1. Clarification of how Medical laboratory analysis can make significant contributions to medical physics
 2. This course deals with the basic concept of the laboratory analysis
 3. Learn about the most important classification of Medical laboratory analysis
 4. To understand the relationship between biochemistry and other sience
 5. Emphasizing the importance of maintaining a healthy body and preventing disease caused by imbalance in the function of the human body
- This will be achieved through, theoretical lectures, tutorials.

Medical Virology:

The study of medical virology is an important field in the medical and biological sciences, this course shows how medical virology can contribute to solving a wide range of scientific problems in the field of medical physics. This course also deals with clarifying the basic concept of medical virology and identifying the relationship of virology with medical applications. In addition to understanding viral diseases and their crucial role in public health, furthermore their roles in developing and adding new applications to medical physics. At the end of the course, students will have an understanding of viral diseases, develop prevention and treatment strategies, and safeguard public health, while Medical virology concepts, techniques, and clinical applications. This will be achieved through theoretical lectures, lessons, scientific visits, and other extracurricular activities.

Module 37			
Code	Course/Module Title	ECTS	Semester
MPH-47131	Medical image processing and analysis	6.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	4	79	71
Description			
<p>Image processing requires fixed sequences of operations that are performed at each pixel of an image. The image processor performs the first sequence of operations on the image, pixel by pixel. Once this is fully done, it will begin to perform the second operation, and so on. The output value of these operations can be computed at any pixel of the image</p> <p>Image processing is the process of transforming an image into a digital form and performing certain operations to get some useful information from it. The image processing system usually treats all images as 2D signals when applying certain predetermined signal processing methods.</p>			

Module 38			
Code	Course/Module Title	ECTS	Semester
MPH-47032	Medical instrumentation physics	5.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	3	79	46
Description			

16. Study the theoretical background, for example about ionizing radiation (origin, measurement, interactions with matter), properties of atoms and nucleus, radioactivity, basic terms of acoustics, electromagnetic spectrum....
 17. Study the most important Instruments for measuring physical and chemical variables in vivo.
 18. Identify the importance of studying the physical mechanism of working.
 19. This course deals with the basic concept of physical laws that used to interpret the principle of machine's working.
 20. Learn about the most important scientific terms (Terminology) and their definitions related to this topic, such as ECG, EEG, EMG.
 21. To perform and develop new techniques for diagnosing machine, such as UV and IR therapy.
- At the end of the course the students will have broad knowledge of the basic physical concepts, technique and applications. This will be achieved through, theoretical lectures, tutorials and laboratory.

Module 39			
Code	Course/Module Title	ECTS	Semester
MPH-47133	Radiotherapy Physics	6.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
5	5	79	71
Description			
Introduction in special theory of External Beam Radiation Therapy (EBRT) ,Photon Beam Therapy, Proton Beam Therapy.How are Photon and Proton Beam Therapies different from each other? ,Brachytherapy (BT),Radiation Therapy Combined with Surgery,Advantages and Disadvantages of Radiation Therapy,Possible Side Effects of Radiation Therapy			

Module 40			
Code	Course/Module Title	ECTS	Semester
MPH-47134	Digital electronics	5.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
79	46	5	3
Description			
<p>1. Explain the basic differences between digital and analog quantities Show how voltage levels are used to represent digital quantities Describe various parameters of a pulse waveform such as rise time, fall time, pulse width, frequency, period, and duty cycle ■ Explain the basic logic functions of NOT, AND, and OR ■ Describe several types of logic operations and explain their application in an example system ■ Describe programmable logic, discuss the various types, and describe how PLDs are programmed ■ Identify fixed-function digital integrated circuits according to their complexity and the type of circuit packaging ■ Identify pin numbers on integrated circuit packages</p> <p>2. Review the decimal number system ■ Count in the binary number system ■ Convert from decimal to binary and from binary to decimal ■ Apply arithmetic operations to binary numbers ■ Determine the 1's and 2's complements of a binary number ■ Express signed binary numbers in sign-magnitude, 1's complement, 2's complement, and floating-point format ■ Carry out arithmetic operations with signed binary numbers ■ Convert between the binary and hexadecimal number systems ■ Add numbers in hexadecimal form ■ Convert between the binary and octal number systems ■ Express decimal numbers in binary coded decimal (BCD) form</p> <p>3. ■ Describe the operation of the inverter, the AND gate, and the OR gate ■ Describe the operation of the NAND gate and the NOR gate ■ Express the operation of NOT, AND, OR, NAND, and NOR gates with Boolean algebra ■ Describe the operation of the exclusive-OR and exclusive-NOR gates</p> <p>4. ■ Analyze basic combinational logic circuits, such as AND-OR, AND-OR-Invert, exclusive-OR, and exclusive-NOR ■ Use AND-OR and AND-OR-Invert circuits to implement sum-of-products (SOP) and product-ofsums (POS) expressions ■ Write the Boolean output expression for any combinational logic circuit ■ Develop a truth table from the output expression for a combinational logic circuit ■ Use the Karnaugh map to expand an output expression containing terms with missing variables into a full SOP form</p> <p>■ Distinguish between half-adders and full-adders ■ Use full-adders to implement multibit parallel binary adders ■ Explain the differences between ripple carry and look-ahead carry parallel adders ■ Use the magnitude comparator to determine the relationship between two binary numbers and use cascaded comparators to handle the comparison of larger numbers ■ Implement a basic binary decoder ■ Use BCD-to-7-segment decoders in display systems ■ Apply a decimal-to-BCD priority encoder in a simple keyboard application</p>			

Module 41			
Code	Course/Module Title	ECTS	Semester
MPH-47035	elective course3 (Medical Antimicrobial + Biotechnology + Medical Labrotory instruments)	4.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
48	52	3	3
Description			
<p>Medical Antimicrobials</p> <ol style="list-style-type: none"> 1. Clarification of how antimicrobials are important in our lives and how to use them properly. 2. Illustration of the major groups of antimicrobials and their mode of action. 3. Clarification of the origins and classification basis of antimicrobials. 4. Learn about the most important microbial resistance mechanisms and how to prevent their spread in the community and environment. 5. To understand and learn about the vaccination and its role in prevention viral and bacterial diseases. <p>Biotechnology</p> <ol style="list-style-type: none"> 1. Clarification of how biotechnology can make significant contributions to a other science in life. 2. Identify biotechnology , classification of biotechnology, branches of biotechnology. 3. This course deals with the basic concept of the most important application aspects of this module. 4. Learn about the most important scientific terms (medicine biotechnology) and their definitions related to this topic. 5. To understand the impact of these types of curing disease by gene therapy. 6. To perform different genetic engineering and gene cloning to transform the desirable gen to cure any disease . <p>Medical Laboratory Instruments</p> <p>The study of medical and biological instruments is an important field in the medical and biological science, this course shows how medical and biological instruments can contribute to solving a wide range of scientific problems in the field of medical physics. This course also deals with clarifying the basic concept of medical and biological instruments and identifying the relationships and applications in medicine and biological field. In addition to understanding the role of this instruments in developing methods and adding new applications to medical physics. At the end of the course, students will have a broad knowledge of the basic medical concepts, techniques ,and applications of this instruments. This will be achieved through theoretical lectures, lessons, scientific visits ,and other extracurricular activities.</p>			

Module 42			
Code	Course/Module Title	ECTS	Semester
MPH-47036	Research Methodology	4.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
33	67	2	4
Description			
<p>This module is designed to introduce postgraduate students to research methods and statistical analysis. Theoretical, historical and statistical concepts are taught in lectures with hands on practical lab sessions using both quantitative and qualitative techniques that allow students to put theory into practice.</p>			

Module 43			
Code	Course/Module Title	ECTS	Semester
MPH-48137	Medical Physics 2	6.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
79	71	5	5
Description			
<p>Medical physicists having special expertise in methods for determining absorbed dose collaborate with the treating physician and the nuclear medicine technologist. If a patient undergoes a dosimetry study prior to radiopharmaceutical therapy, the patient may receive a small "dosimetry" amount of the therapeutic radiopharmaceutical prior to actual treatment. The nuclear medicine technologist will then collect three or more nuclear medicine images at different times after the dosimetry administration. In some cases, only one image will be collected. The treatment team may collect blood, urine, and stool samples. The medical</p>			

physicist then uses the dosimetry measurements to calculate an appropriate treatment for the therapy, based on the patient's unique biodistribution and clearance patterns from the body. In this way, dosimetry ensures that the patient receives a personalized, safe, and effective treatment.

Module 44			
Code	Course/Module Title	ECTS	Semester
MPH-48138	Neurophysics	6.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
79	71	5	5
Description			
<ol style="list-style-type: none"> 1. Clarification of how Neurobiophysics can make significant contributions to a 2. Identify the basic of neurobiophysics which are useful in in medical physics sciences. 3. This course deals with the basic concept of the nervous system 4. Learn about the most important classification of nervous system 5. To understand the relationship between body organs and nervous system. 6. Emphasizing the importance of maintaining a healthy body and preventing disease caused by imbalance in the function of the nervous system <p style="margin-left: 40px;">This will be achieved through, theoretical lectures, tutorials and laboratory</p>			

Module 45			
Code	Course/Module Title	ECTS	Semester
MPH-48039	Material science and nanotechnology	5.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
49	76	3	5
Description			
<ol style="list-style-type: none"> 1. Understand the properties of materials. 2. The arrangement and bonding of atoms in crystalline solids 3. The geometric structure of crystal lattices. 4. X-ray diffraction; Producing, Uses, Applications, Types of X-ray diffraction. 5. Determine positions of atoms contained in the unit cell by Fourier transform technique. 6. Binding force and energy between atoms and molecular. <p>Advantages and disadvantages of defect in crystals.</p>			

Module 46			
Code	Course/Module Title	ECTS	Semester
MPH-48040	Biomaterials	5.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
49	76	3	5
Description			

Clarification of how biomaterials can make significant contributions to a wide range of medical problems and in medical physics sciences. The aim of this course is to introduce the students to main topics of biomaterials. The course will cover introduction to biomaterials, biological material, biocompatibility, use of biomaterials. biomaterials in organs, materials for ,use in the body, polymers, metals, composite materials, ceramics, biodegradable materials, biodegradable hydrogel, biodegradable polymeric biomaterials, Toxicology, Healing, Mechanical properties of biomaterials, traditional engineering materials, biological soft tissue materials, thermal properties of biomaterials, chemical properties of biomaterials, bio ceramics, hard tissues, application in biomedical field, metals and alloys, stainless steel, titanium and its alloys, excellent corrosion resistance.

At the end of the course, students will have a broad knowledge of the basic concepts, techniques and applications of biomaterials. This will be achieved through theoretical lectures, tutorials and homework.

Module 47			
Code	Course/Module Title	ECTS	Semester
MPH-48041	elective course4 (Physiology of Infectious diseases + Behavior and sensing from micro to human + Medical Bioinformatics)	4.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
48	52	3	3
Description			
Physiology of Infectious diseases The course aims to provide the student with full definition and the mode of transmission of some common infectious diseases in different part of the human body; and also to introduce information about the etiological pathogens and the factors of pathogenicity. It also explains the mechanism of pathogenicity and the physiological events occur in the human cells and tissues and the host immune responses during the process of infection. In addition to, the course aims to provide full information that help the student to understand the body response and manifestations resulted from imbalances in homeostasis during these diseases. The course also helps the student to relate symptoms and manifestations to analyze and solve problems related to the diagnosis and treatment of infectious diseases. The course also aims to help the			

student to bind the medical microbiology with anatomic pathology to prepare a professional staff with clinical and literature skills able to offer a required care to patients with infectious diseases.

Behavior and sensing from micro to human

1. Clarification of how microbes are important in our bodies.
2. Illustration and comparison of microbial and human sensing tools and the structures involved in their behavior.
3. Clarification of the vital roles the microbiota have in our health and sickness.
4. Learn about the most important genetic disorders and diseases and the potential role of microbiota in their development and progression.
5. To understand and learn about the future aspects of microbiota in diagnosis and prevention of human disorders and diseases.

Medical Bioinformatics

The module seeks to understand how medical bioinformatics make significant contributions to a wide range of scientific benefits in medical physics sciences. This course deals with the basic concept of medical bioinformatics and related tools and programs. Learn about the most fundamental concepts of important topics in medical bioinformatics such as decipher of DNA sequence, gene sequence alignments and medical bioinformatics databases. Moreover, the module tries to understand and comprehend the impact of medical bioinformatics processes on medical physics science. At the end of this course, students should be able to demonstrate a clear understanding of the facts and basic concepts of medical bioinformatics which are covered in lectures. This will be achieved through, theoretical lectures, tutorials and practical training.

Module 48			
Code	Course/Module Title	ECTS	Semester
MPH-48142	Research project	4.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
48	52	3	3
Description			

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