جامعة الإسراء
ISRA UNIVERSITY

Faculty of Allied Medical Sciences

Department of technology of Radiographic Imaging

Description of Courses for the Bachelor Degree in Technology of Radiographic Imaging

2021 / 2022

Description of Courses offered by the Department of Technology of Radiographic Imaging

Course Number **Course Name (Prerequisite: -)** **(…..) Cr. Hrs**

Course Number	Course Name (prerequisite)	Credit hours
12021111	**Diagnostic Radiation Physics**	
This course aims to study the phenomenon of radioactivity and radioactive decay. It discusses the interactions between charged particles as well as neutrons with matter and identifies the types of radiation and particles resulting from the radioactive decay and their medical uses, and introduces students to the devices of medical imaging that uses these rays and particles. X-Ray tube and X-Ray generation will explained in this course.		
12021211	**Fundamentals of Medical Imaging**	
This course explains the basics of medical imaging and introduces the students to the various medical imaging modalities such as (X-ray machine, CT, MRI, NM, US) and their principle of operations. Furthermore, this course explains the different types of medical radiations used in medical imaging and the mechanism of their production and interaction with the materials.		
12022112	**Radiographic Film Processing & Exposure (12021211م)**	
This course is concerned with building up the knowledge of planner X-Ray Imaging. The course starts by revising some of radiation physics before it moves to explain the required tools before the X-ray beam hits the film. This includes intensifying screen, beam restrictors, and grid. Radiographic Film is the major tool for displaying the X-Ray radiographic information (which is connected to the human tissue clinical situation). Therefore, the course explains in details the structure of the radiographic film. Then, the course moved to describe how the X-Ray radiation are transformed to silver depositions (i.e. the formation of the latent image). Later, the course concentrates on how the latent image is "processed" to form the visible radiographic shades (i.e. final radiographic film). The "processing" procedures and the necessarily chemical components are explained in details. This covers both the manual and automated "processing". Then, the course explains the main characteristics of the radiographic film such as the optical density, film contrast, film gamma, and the film Latitude. These parameters are of great importance since they determine both "how to use film optimally" and "what are the required imaging factors?". The understanding of these parameters controls the quality of the resulting radiographic film.		
12022113	**Radiobiology (12011213)**	
This course explains the basic concepts of radiation dosimetery, radiation chemistry and effects of ionizing radiation on human body including both the genetic and somatic effects, the radiation effects at the subcellular, cellular, tissue and organs levels, the response and sensitivity of cells and tissues to radiation, theories and models for cell survival and modification of the biological effects of radiation, safety procedures when using radiation at the individual and community levels, and the proper use of radioactive materials		
12022213	**Radiation Protection (12021111)**	
This course covers different topics; the sources of ionizing radiation and radioactivity, the X-ray dose concept, dose limitation and dose reduction, methods of reducing exposure to patients and workers from radiation in radiographic centers, general procedures used for prevention and protection from radiation, design and layout of diagnostic radiology equipment, and the use of radiation survey monitoring for occupational exposures.		
12022244	**Digital radiography (12022112)**	

This course forms an introduction into the principles of computed and digital radiography and their applications in the field of medical imaging. The advantages and disadvantages of digital over screen-film radiography will also be covered in this course. Furthermore, this course provides an insight and an understanding of different digital-based imaging modalities such as; digital fluoroscopy, digital mammography, computed tomography and magnetic resonance imaging and their clinical applications. In addition, this course covers the different digital image pre-processing and post-processing techniques used to improve the interpretation of different medical images.		
12022226	**Radiological Imaging Procedures (1) (12022112+12022244م)**	
Specific skills are required to perform and evaluate radiographic examinations of the chest, abdomen, upper extremities, and lower extremities with emphasis on image quality, patient care, and adaptation to a variety of client conditions		
12023111	**Quality Control of X-Ray Radiographs (12022112+12022244م)**	
This course introduces the student to the principles of radiographic techniques which producing the best diagnostic image quality. Therefore, Quality control is the use of diagnostic tools to detect trends that will eventually cause repeated exposures to the patient, and correct them before such unnecessary exposures come about. By definition, then, QC plays a vital role in minimizing patient exposure		
12023115	**Methods of Patient Care**	
This course develops knowledge and skills in basic concepts of patient care. Includes emergency care procedures, vital sign assessment, body mechanics, sterile techniques, intravenous equipment and administration, infection control, patient safety and transfers, communication, and patient education		
12023122	**Radiological Imaging procedures (2) (12022226)**	
Studies a variety of radiographic procedures of the skull, sinuses, spines, lumbosacral, sacrum, coccyx, breast mammography, and tomographic demonstration. Independent decision making regarding trauma radiography is also included		
12022225	**Nuclear Medicine Imaging (1) (120121211)**	
Nuclear Medicine Imaging (NMI or NM) is a major branch of medical imaging systems. There are three main NMI devices. These are Gamma Camera (Planner NM Imaging), Single Photon Emission Computerized Tomography SPECT, Positron Emission Tomography PET. Basically, these systems are concerned of observing the distribution of a radiopharmaceutical within human. The resulting NM images give clinical information about certain functions of human organs. This matter is not acheivable, or is not easily achievable, by other medical imaging modalities such as CT and MRI. This course serves as a review of basic concepts of NM imaging instrumentation (Gamma Camera, SPECT, PET). Also, it provides explanation of the all associated issues related to radio- pharmaceuticals including the process of production, localization, uptake, clearance, and other associated aspects.		
12023133	**Computed Tomography (1) (12022226م)**	
This course introduces the students to the basic principles of computed tomography (CT), including the physics and instrumentation related to CT. CT image quality and patient dose are also covered in this course.		
12023238	**Magnetic Resonance Imaging (1) 12023122م**	
This course covers different basic topics such as basic physics of NMR, relaxation phenomena, relaxation time measurement, basic NMR imaging theory and methods, biophysical background of tissue NMR, image contrast manipulation, basic imaging pulse sequences, spatial encoding, k-space, hardware for MRI, quality control and MR safety		
12023124	**Nuclear Medicine Imaging (2) (12022225)**	
This course further explains the combination of nuclear medicine imaging methods (PET and SPECT) integrated with CT and MRI (PET/CT, SPECT/CT, and PET/MRI) to become a single Imaging scanner (i.e. Multi-modality imaging). Instrumentation, advantages, and main clinical applications are introduced.		
12023227	**Radiological Imaging procedures (3) (12023122)**	
Radiographic procedures of the excretory system, reproductive system, and the alimentary canal. This includes patient preparation for Imaging and use of contrast media and drugs. In addition this courses explains the different angiographic procedures used to diagnose and treat patients with cardiovascular problems		
12023236	**Computed Tomography (2) (12023133)**	

This course aims at introducing the students to the clinical use of computed tomography. In addition, different CT imaging protocols, factors and modifications will be covered in this course. One important aim of this course is to understand how to deal with patients before, during and after CT examination.		
12024132	**Magnetic Resonance Imaging (2) (12023238)**	
This course covers advanced and clinical MRI topics such as fast imaging techniques (fast gradient echo, fast spin echo, Echo planar imaging EPI, parallel imaging), tissue suppression techniques, MR artifacts, MR contrast agents, chemical shift imaging, magnetization transfer imaging, diffusion imaging, functional MRI, flow imaging, MR angiography, cardiac gated imaging, clinical imaging protocols, and in vivo NMR spectroscopy		
12024131	**Cross Sectional Anatomy (12023133+12023238)**	
This course allows the student to identify different structures of human body on both computed tomography (CT) and magnetic resonance (MR) images in different planes. This course also offers the student with the opportunity to practice viewing the anatomical structures and organs in both two dimensional (2D) and three dimensional (3D) planes in relative to some internal and external landmarks		
12024243	**Principles of Radiological Diagnosis (12024131)**	
Understanding the basic principles of pathology is an essential part of the radiologic technologist's training. Knowing how disease processes work. Recognizing the radiographic appearance of specific disease can aid the technologist in selecting proper modalities and determining the proper imaging technique		
12024244	**Quantitative Analysis of Medical Images (12023133+12023238+1202225)**	
Quantitative imaging provides clinicians with more accurate picture of disease state by applying algorithms, that precisely measure various aspects of an abnormality in medical images to allow clinicians to extract quantitative information from images in an effort to help identify disease earlier, predict prognosis, and assess treatment efficacy as well. So, this course is planned to offer the student with the various image processing and analysis methods commonly used in medical imaging applications such as image smoothing, spatial co-registration, normalization, segmentation, and fusion. Furthermore, different quantitative analysis methods such as region of interest, volume of interest, histogram-based analysis, voxel-based morphometry will also be covered in this course.		
12024196	**Medical Imaging Internship (1) (12023133 + 12023227)**	
In this training course, the student will spend 18 hours per week at different attached hospitals and medical centers and during which the student will have the chance to practice the skills gained while studying the radiological imaging procedures (1 and 2). These include imaging the respiratory system, abdomen, pelvis, upper and lower extremities, skull, neck, sinuses, vertebral column.		
12024297	**Medical Imaging Internship (2) (12024196)**	
In this training course, students will spend 18 hours per week at different attached hospitals and medical centers and during which students will have the chance to practice the skills gained while studying the radiological imaging procedures (3), Magnetic Resonance Imaging (MRI) and Computed Tomography (CT).		
12023281	**Special Topics in Medical Imaging**	
Advanced study in one of the areas of Medical Imaging chosen at the beginning of the semester to expand the knowledge of students in this area of Medical Imaging and to train them to use the library as well as electronic resources properly		
12022221	**Radiotherapy**	
This course introduces the student to both basic physical principles of radiation therapy and physical aspects of treatment planning using photon beams, electron beams and brachytherapy sources. For the modern clinical radiation therapy, additional information will be discussed such as Intensity Modulated Radiation Therapy and Stereotactic Radio-surgery		
12022142	**Diagnostic Ultrasound**	
This course introduces the student to comprehensive coverage of the physical principles of Diagnostic Ultrasound (US) and its clinical applications, the theoretical foundations necessary for the clinical practice of US scanning and understanding of 3D anatomical images as they related		
12013161	**Research Methods**	
This course is an introduction to the research methods in medical sciences profession (physiotherapy, Anesthesia, Technology of Medical imaging). Topics covered include: research design, hypothesis, Identify research problems and sampling procedures, literature review, and writing skills.		

12023231	Molecular Imaging	
This course provides a comprehensive overview of the key concepts in molecular imaging. The course goal is to introduce the imaging methods and concepts that are used in molecular structure and dynamics analysis. Molecular imaging differs from traditional imaging in that probes, known as biomarkers, are used to help image particular targets or pathways. This course will introduce the attendees to the fundamentals of molecular imaging: biological mechanisms and molecular probes, imaging technologies and their applications, with great focus on SPECT, PET, and MRI		
11031164	**Statistics**	
Introduction to statistics, populations and samples, frequency distributions; measures of centrality, dispersion, skewness and kurtosis; correlation & regression; principles of probability, laws of addition and multiplication, total probability rule, Bayes rule, random variables, discrete and continuous probability distributions, binomial distribution, poisson distribution.		
120222101	**Computers in Medical Imaging**	
This course revise the basic hardware of computers. It explains common operating systems, then it moves to introduce application of computers in medicine. The course also rehearse students how to use common software such as Microsoft Excel, Image platforms (e.g. ImageJ), and famous statistical packages.		