Specialization	**Radiologic Technology**
Course Number	**020810171**
Course Title	**Physics Of Advanced Imaging Modalities"1"**
Credit Hours	**(3)**
Theoretical Hours	**(2)**
Practical Hours	**(3)**

Brief Course Description:

- This course aims to provide the students with the basic physical principles of Ultrasound, nuclear medicine and digital video imaging (DVI) as well as the major configuration of these units and how to obtain a high quality images in addition to understand the safety measures of thesesystems

Course Objectives:

Upon the completion of the course, the student will be able to:

1. Know the basic physical principles of thissystem.
2. Know the major configuration of thissystem.
3. Know the safety measures of thesesystems.
4. Apply practical skills related to theoretical material.

Unit number	Unit name	Unit content	Time needed
1	**Ultra-Sound (US)**	• Characteristic of sound:Longitudinal waves, velocity of sound intensity. • Transducer and its components. • Characteristic of piezoelectric crystals. • Interaction between ultrasound and matter: Reflexion, refraction, absorption. • Attenuation and penetration of ultrasound. • Ultrasound display : a-mode, tm mode, b mode. • Grey scale imaging. • Types of scan conversion memory. • Real time imaging : Methods, technique. • Controls in ultrasonic imaging. • Artifacts. • Doppler methods: continuous wave Doppler pulsed Doppler real time color flow imaging.	
2	**Nuclear Medicine**	• Safety considerations. • Radioactivity: stable nuclei, isotopes, radionuclides their production and their production. • Decay (radioactive transformation) o Nuclides withneutronexcess. o Isomeric transition. • Nuclides with a neutron deficit. • Position emitters. • Radioactive decay. • Activity. • Radiopharmaceuticals properties • Preparation ofradiopharmaceuticals. • Quality control tests. • Dose to the patient: o Does to the organs. o Effective dose to the body. • Precaution taken in handling of radionuclides, separation, personal protection, patient protection, dealing	

		with radioactive spill, disposal of radioactive waste. • Gamma imaging: components of gamma camera: o Mutable collimator o Crystal o Photo multiplayer o Pulse arithmetic o Plus height spectrum	
3	**Digital Video Imaging (DVI) (digital Radiography)**	• Fluoroscopy and image intensifier. • Dual and triple mode intensifiers. • Beam splitter. • Vignetting. • The television system. • Cameras. • Digital imaging and its equipment. • Image processing, storage and recording: windowing, • Background subtraction, noise reduction. • Digital image processor: function, analog to digital conversion, digitization accuracy • Digital subtraction angiography (DSA): o Techniques: mask subtraction. o Dual energy subtraction (DES). o Time interval differencing (TID). o Temporal filtering. o Hybrid subtraction. • Digital imaging processing : o General types of image processing.	

Teaching Methodology:

1. Lectures.
2. Discussion, Seminars &Quizzes.
3. Home works .
4. Demonstration and practical training.
5. Training field competencies assessment.

Text Book and References:

1. The Essential Physics of Medical Imaging, Third EditionDec 28, 2011by Jerrold T. Bushberg and J. Anthony Seibert .
2. Imaging Systems for Medical Diagnostics: Fundamentals, Technical Solutions and Applications for Systems Applying Ionizing Radiation, Nuclear Magnetic Resonance and Ultrasound 2nd Edition by ArnulfOppelt (Editor)
3. Christensen's Physics of Diagnostic Radiology Fourth Edition by Thomas S. Curry III MD (Author), James E. Dowdey PhD (Author), Robert E. Murry Jr. PhD (Author)1994.
4. Review of Radiological Physics Dec 2002 by Walter Huda and Richard M. Slone.
5. Diagnostic Radiology: Recent Advances and Applied Physics in Imaging (Aiims-mamc-pgi Imaging)Aug 1, 2013 by Gupta, Arun Kumar, M.D. and Chowdhury, Veena, M.D.
6. The Physics and Technology of Diagnostic Ultrasound: A Practitioner's GuideApr 4, 2012 by Robert Gill