

Department of

RADIOLOGIC SCIENCES

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DEPARTMENT OF RADIOLOGIC SCIENCES

Radiologic Sciences is the profession whose members have the responsibility to provide skilled technical expertise in Diagnostic X-Ray Departments (Radiologic and Special Imaging Technologist) and Nuclear Medicine Departments (Nuclear Medicine Technologist).

The Radiologic Technologist is the professional whose role is to produce radiographs (X-Ray studies) of various body parts and systems, submitting them to the radiologist for diagnostic interpretation. The curriculum includes radiation sciences, radiologic imaging, patient care, quality assurance, management and curriculum studies. Responsibilities include the manipulation of sophisticated equipment including computer reconstructed imaging. Graduates possess the skills to assume positions as radiographers and quality assurance coordinators and, with experience, positions as managers or instructors in radiology.

Nuclear Medicine Technology involves the use of radioactive materials for diagnostic and therapeutic purposes. The responsibilities of a Nuclear Medicine Technologist include the preparation of radio-pharmaceuticals for organ imaging, performing different imaging procedures, and image processing and data analysis using sophisticated equipment such as gamma cameras, computers, and various other radiation detectors.

The goal of the programme is to produce competent, skilled practitioners who can assume positions in hospitals, clinics, research laboratories, industry and government agencies. To achieve this goal, students are enrolled in a course of study that includes basic biological, physical, computer and radiation sciences in addition to clinical training in the teaching hospitals and clinics.

MISSION AND OBJECTIVES

Mission

The mission of the Department of Radiologic Sciences is to train and educate skillful, knowledgeable and committed Diagnostic Radiographers and Nuclear Medicine Technologists who have breadth of knowledge and competence in Diagnostic Radiography or Nuclear Medicine Technology, who shall adhere to professional ethics, and who can contribute successfully as Technologists in the health care team. The Department also aims to contribute to the development of the Radiologic Sciences profession and allied health services in Kuwait, both in the Kuwait health care delivery system and in private hospitals, by providing consultancy and other services.

Objectives

The key objectives, therefore, are:

1. To develop, monitor, evaluate, review and maintain an undergraduate curriculum that provides:
 - An essential core of knowledge and skills
 - Opportunities to develop clinical competence through laboratory practice in the Faculty and hands-on experience in Ministry of Health hospitals and clinics
 - Patient Care and Management
 - A thorough grounding in professional ethics in Radiologic Sciences
2. To foster the requisite professional attitudes and values in students, who shall adhere to professional ethics and demonstrate concern, responsibility and the ability to interact appropriately with other care providers, administrators, patients and their families.
3. To provide students with the necessary support and guidance in terms of counselling, and feedback on academic and clinical performance.
4. To use alternative learning modes, including:
 - Computer-assisted learning
 - Problem-based learning
 - Research projects

- Student presentations
5. To have well-functioning laboratories, namely:
 - General radiography
 - Ultrasound
 - Mammography
 - Computer Tomography (C.T.)
 - Image Processing
 - Magnetic Resonance Imaging (M.R.I.)
 - Bone Mineral Densitometry (B.M.D.)
 - Nuclear Medicine
 6. To develop and provide post-graduate programmes, short courses, lectures, workshops and seminars for the Ministry of Health staff that meet the changing health care needs of Kuwait and keep them abreast of the state-of-the-art.
 7. To recruit well qualified and experienced teaching and support staff who will act as role models for students and keep themselves updated with scientific advances in the field and apply the state-of-the-art in all endeavours: teaching, curriculum development and assessment, research, clinical supervision and community service.
 8. To provide consultancy services to hospitals and clinics in the public sector health care delivery system and in the private sector.

PROGRAMME REQUIREMENTS

The total number of credit hours required for graduation is 121 in the Diagnostic Radiography track and 125 in the Nuclear Medicine Technology track. The programme for the B.Sc. Degree in Radiologic Sciences is as follows:

1 UNIVERSITY REQUIREMENTS (19 credits)

Credit Hours

0410-115 Finite Mathematics	3
0788-181 English Language	5
0788-182 English Language	5
0788-250 English Language	3
Elective	3

2 FACULTY REQUIREMENTS (23 credits)

0490-101 Biology	3
0711-105 Introduction to Health Informatics	3
0700-106 First Aid and Emergency Care	3
0480-107 Statistics for Medical Sciences	3
0420-110 Chemistry	3
0420-111 Chemistry Lab	1
0430-121 Physics	3
0430-125 Physics Lab	1
0510-220 Psychology of Medical Care (AHS)	3

3 PROFESSIONAL REQUIREMENTS

Track I: Diagnostic Radiography (79 credits)

0530-152 Physiology I	3
0700-155 Anatomy I	3
0700-210 Anatomy II	2
0714-202 Patient Care and Management	2
0714-204 Introduction to Medical Physics	4
0714-205 Fundamentals of Radiologic Technology	4
0714-354 Imaging Procedures I and Lab.	3
0714-361 Clinical Practicum I	3
0714-362 Imaging Procedures II and Lab.	3
0714-365 Digital Imaging Techniques	3
0714-373 Clinical Practicum II	5
0714-374 Physics of Medical Imaging I and Lab.	4
0714-375 Physics of Medical Imaging II and Lab.	4
0714-376 Radiologic Imaging & Processing	3
0714-378 Pathology in Imaging I	3
0714-432 Radiation Protection & Radiology	2
0714-450 Special Imaging Procedures	3
0714-455 Imaging Procedures III and Lab.	3
0714-466 Computer Applications in Imaging	3
0714-472 Clinical Practicum III	5
0714-473 Clinical Practicum IV	6
0714-478 Pathology in Imaging II	3
0714-481 Quality Assurance (DR)	2
0714-495 Research	3

Track II: Nuclear Medicine Technology (83 credits)

0530-152 Physiology I	3
0700-155 Anatomy I	3
0700-210 Anatomy II	2
0714-202 Patient Care and Management	2

0714-204 Introduction to Medical Physics	4
0714-205 Fundamentals of Radiologic Technology	4
0715-332 Radiation Protection & Radiology	2
0715-354 Imaging Procedures I and Lab.	3
0715-356 Chemistry for Nuclear Medicine	3
0715-362 Imaging Procedures II and Lab.	3
0715-365 Digital Imaging Techniques	3
0715-370 Clinical Practicum I	4
0715-371 Clinical Practicum II	4
0715-374 Physics of Medical Imaging I and Lab.	4
0715-378 Pathology in Imaging I	3
0715-384 Physics of Medical Imaging II and Lab.	3
0715-450 Special Imaging Procedures	3
0715-452 Nuclear Pharmacy & Pharmacology	3
0715-455 Imaging Procedures III and Lab.	3
0715-457 Non-imaging Procedures	2
0715-466 Computer Applications in Imaging	3
0715-472 Clinical Practicum III	5
0715-473 Clinical Practicum IV	6
0715-478 Pathology in Imaging II	3
0715-482 Quality Assurance	2
0715-495 Research	3

PROGRAMME TIMETABLE

FIRST YEAR

Semester One	Semester Two		
Course	CH	Course	CH
110/111 Chem. & Chem. Lab.	4	121/125 Phys. + Phys. Lab.	4
or 121/125 Phys. & Phys. Lab.		or 110/111 Chem. & Chem. Lab.	
115 Finite Mathematics	3	101 Biology	3
181 English Language	5	106 First Aid & Emergency Care	3
Elective	3	182 English Language	5
	Total 15		Total 15

SECOND YEAR

432 Rad Protection & Radiobiology 2		450 Special Imaging Proc.	3
455 Imaging Procedures III & Lab.	3	478 Pathology in Imaging II	3
466 Computer App. in Imaging	3	495 Research	3
481 Quality Assurance (DR)	2	473 Clinical Practicum IV	6
472 Clinical Practicum III	5		

Total 15

Total 15

TRACK II: NUCLEAR MEDICINE TECHNOLOGY
(Total credits: 125)

THIRD YEAR

Semester One

Semester Two

Course	CH	Course	CH
354 Imaging Procedures I & Lab	3	332 Radiation Protection & Radiobiology	2
356 Chemistry for Nuc. Med.	3	362 Imaging Proc. II & Lab.	3
365 Digital Imaging Techniques	3	378 Pathology in Imaging I	3
374 Physics of Medical Imaging I	4	384 Physics of Medical Imaging II & Lab	3
370 Clinical Practicum I	4		
371 Clinical Practicum II	4		

Stoichiometry; electronic structure of atoms, periodic table; chemical bonds, introduction to chemistry of elements; chemical thermodynamics, chemical kinetics; chemical equilibria, acids and bases in aqueous solutions.

0420-111 CHEMISTRY LAB (0-3-1) (Faculty of Science)

Laboratory experiments are carried out to verify the theories learnt in 0420-110 Chemistry.

Corequisite: 110 Chemistry

0410-115 MATHEMATICS (3-0-3) (Faculty of Science)

Algebra of sets. Simple coordinate systems and graphs. Geometric approach to linear programming. Basic ideal of simplex method. Probability and applications to medical sciences. Statistics.

0788-181 ENGLISH LANGUAGE (10-0-5)

181 English is the first of three required English Language courses offered in the Faculty. It is a reading-based, multi-skills course intended to advance students' abilities to study content area courses in English. The macro-skills of reading, writing, listening, speaking and grammar are broken down into their component parts to give the students the opportunity to acquire fluency and accuracy in the language of the health sciences.

YEAR ONE, SEMESTER TWO

0430-121 PHYSICS (3-0-3) (Faculty of Science)

Methods of physics, elementary mathematics, motion and particle dynamics, mechanics of extended objects, conservation of energy, kinetic theory of gases, liquids, vibrations and waves, ear and hearing, electricity and conduction in solids, ions and ionic conduction.

0430-125 PHYSICS LAB (0-3-1) (Faculty of Science)

Laboratory experiments are carried out to verify the theories learnt in 0420-121 Physics.

Corequisite: 121 Physics

0490-101 BIOLOGY (2-3-3)

(Faculty of Science)

Cellular basis of life: differences in size and complexity of cells as illustrated by viruses, bacteria, protozoa and various types of metazoan cells. Structure and metabolic activities of a generalized eukaryotic cell. Chemical composition and functions of the cell membrane; role of mitochondria, structure of GER and SER and their relation to the Golgi apparatus; structure of the nuclear membrane. Central role of enzymes in cells. Structure of DNA and RNA. Genetic code and protein synthesis. Mitosis and meiosis. Mendelian genetics and inherited diseases. Interactions between eukaryotic cells and bacteria and viruses. Cell mediated immunity. Organization of cells into tissues.

0788-182 ENGLISH LANGUAGE (10-0-5)

182 English expands on the content and on the five basic language learning skills introduced in 181 English. Students read and listen to materials of a scientific/medical nature, discuss the topics with their classmates to broaden their comprehension, and then write about the topics they have discussed to show they are able to communicate comprehensibly. Grammar instruction is explicit and includes the grammar of science and medicine. **Prerequisite: 181 English**

0700-106 FIRST AID AND EMERGENCY CARE (2-2-3)

This course is designed to provide students with basic knowledge of first aid and the skills needed to provide early interventions and care in the event of a health emergency. It enables students to plan an assessment for each casualty, using a methodological two-stage system, first to check and treat life-threatening conditions (primary survey), then to call for help. An overall view of the basic fundamentals of first aid is presented with an emphasis on decision making in emergency situations.

Prerequisite: 180 English Language

YEAR TWO, SEMESTER ONE**0700-155 ANATOMY I (2-3-3)**

This course provides an introduction to human morphology at the cell, tissue, and organ system levels of organization. The course is taught through theoretical lectures and practical demonstrations. **Prerequisite: 181 English Language**

0714-202 PATIENT CARE AND MANAGEMENT (2-0-2)

Care and management of the patient in the clinical setting. Attention is given to the professional ethics, interpersonal relationships and psychology of the ill patient. Nursing procedures such as management of sterile fields, drugs (contrast agents) and patient management during allergic reactions and other common emergencies are stressed.

Prerequisite: 106 First Aid and Emergency Care

0714-204 INTRODUCTION TO MEDICAL PHYSICS (3-3-4)

The course provides basic knowledge in Physics relevant to medical applications. Students will be prepared to apply the principles learnt here in specialised courses in their chosen track in the subsequent years. Laboratory experiments are carried out to verify the theories learnt.

Prerequisite: 121 Physics I; 125 Physics Lab

0711-105 INTRODUCTION TO HEALTH INFORMATICS (2-2-3)

This course is designed to introduce the students to the fundamentals of information technology and systems from the perspective of health informatics. It provides the students with a wide spectrum of computer related concepts and skills to ensure that they are capable of employing appropriate technologies and tools to manage health information as it relates to their respective discipline. The course covers a variety of topics including: computer concepts, computer technology and information systems, statistical software, communication technology, database design and management, clinical, business and specialty system applications.

Delivery methods employed for this course combine didactic theory supplemented by lab sessions that will provide hands-on applications of learned theory.

0788-250 ENGLISH LANGUAGE (6-0-3)

Language and study skills are perfected using authentic health sciences journal articles relevant to the students' majors. Report writing style, abstract writing, bibliography and referencing techniques are taught.

Prerequisite: 182 English Language

YEAR TWO, SEMESTER TWO

0480-107 STATISTICS FOR MEDICAL SCIENCES (3-0-3)

(Faculty of Science)

Relevance and principles of Biostatistics with application in Medicine and Biology. Descriptive statistics, sampling and sampling distributions. Estimation of parameters, probability and probability distribution, with emphasis on the normal. Tests of hypotheses for one or two means and one or two proportions. Measures of association between two continuous variables (correlation and regression) and two discrete variables (chi-square). Non-parametric tests commonly used in medicine.

Prerequisite: None

0510-220 PSYCHOLOGY OF MEDICAL CARE A.H. (2-2-3)

(Faculty of Medicine)

The course provides an overview of Psychology as the basic science concerned with individual human behaviour and mental processes. Empirical studies and theoretical models of basic processes such as learning, memory and perception are introduced. Factors that motivate behaviour are considered, as well as contemporary models that describe and seek to explain the major dimensions of temperament and personality variation. The course also draws on the material taught in the first part to clarify issues relating to patients' compliance and satisfaction with the medical care they receive.

Prerequisite: 182 English Language

0530-152 PHYSIOLOGY I (2-2-3)

(Faculty of Medicine)

The course provides a basic understanding of the physiology of the cell, body fluids, nerves, muscles, blood, functions of the cardiovascular system, respiratory system, renal system, gastro-intestinal system, endocrine system and reproductive system. Emphasis is placed on the interactions of the systems.

Prerequisite: 155 Anatomy I

0714- 205 FUNDAMENTALS OF RADIOLOGIC TECHNOLOGY (3-3-4)

An introduction to imaging in Diagnostic Radiology & Nuclear Medicine and the fundamentals of operation and use of imaging modalities in both tracks.

Prerequisite: 204 Introduction to Medical Physics 202 Patient Care and Management

0700-210 ANATOMY (1-3-2)

A study in depth of the locomotor system and the peripheral nerves. The structure of the vertebral column, the respiratory system and the heart and diaphragm. General structure of the abdominal wall and abdominal viscera. The mechanics of respiration and the joints of the cranium. The blood vessels and lymphatics of the upper and lower limbs. The skull and facial muscles are also studied. **Prerequisite: 155 Anatomy I**

TRACK 1: DIAGNOSTIC RADIOGRAPHY

YEAR THREE, SEMESTER ONE

0714-354 IMAGING PROCEDURES I AND LAB (2-3-3)

Presentation and demonstration of instrumentation and patient manipulation for diagnostic imaging of body systems. **Prerequisites: All Year Two courses**
Corequisites: 361 Clinical Practicum I 374 Physics of Medical Imaging I and Lab

0714-365 DIGITAL IMAGING TECHNIQUES (2-3-3)

This course is an introduction to digital imaging techniques, and their application to radiology and nuclear medicine. Didactic material is presented in the classroom and applications are investigated in the computer laboratory using commercial software. The fundamentals of spatial and grey-level quantization are reviewed. Students will analyse and implement various algorithms for image enhancement, selecting and using appropriate techniques. Image segmentation by thresholding and morphological operations is included. **Prerequisites: All Year Two courses**
Corequisites: 374 Physics of Medical Imaging I and Lab 354 Imaging Procedures I and Lab

0714-374 PHYSICS OF MEDICAL IMAGING I AND LAB (3-3-4)

The course explores the nature of particulate and electromagnetic radiation, their production, interactions, detection and applications. Topics also include the structure and function of some equipment in the production of x-rays.
Prerequisites: All Year Two courses Corequisites: 376 Imaging and Processing

0714-

376 IMAGING AND PROCESSING (2-3-3)

The course introduces students to the fundamental principles of conventional radiographic image acquisition and processing. It also provides a basic introduction to the types of imaging equipment used in diagnostic imaging. Physical principles required to produce a diagnostic radiograph, including prime exposure factors, film processing techniques and chemistry, film-screen combinations and construction, processing artifacts, and radiographic accessories are covered.

Prerequisites: All Year Two courses

0714-361 CLINICAL PRACTICUM I (0-12-3)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging. Emphasis is placed on competency evaluation of clinical practice.

Prerequisites: All Year Two courses Corequisites: 354 Imaging Procedures I and Lab 374 Physics of Med. Imaging I and Lab

YEAR THREE, SEMESTER TWO

0714-362 IMAGING PROCEDURES II AND LAB (2-3-3)

Presentation and demonstration of instrumentation and patient manipulation for diagnostic imaging of body systems.

Prerequisites: All Year Three, Semester One courses Corequisites: 378 Pathology in Imaging I 375 Physics of Medical Imaging II and Lab

0714- 375 PHYSICS OF MEDICAL IMAGING II AND LAB (3-3-4)

This course is a continuation of Physics of Medical Imaging I and deals with the physical principles used in imaging modalities such as x-ray fluoroscopy, mammography, digital radiography, tomography (conventional, computed, spiral), ultrasonography and magnetic resonance imaging. **Prerequisites: All Year Three, Semester One courses**

0714-

378 PATHOLOGY IN IMAGING I (3-0-3)

The study of disease processes affecting the human body in relation to etiology, organ system involvement, pathological changes in the structure and function of tissues and organs, specific physical signs and symptoms, diagnostic procedures and common complications. The course also covers pathologic manifestations on the radiograph and the subsequent technical variation required to produce an optimal radiographic examination.

Prerequisites: All Year Three, Semester One courses Corequisites: 375 Physics of Medical Imaging II and Lab

0714-373 CLINICAL PRACTICUM II (0-20-5)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging and therapy. Emphasis is placed on competency evaluation of clinical practice.

Prerequisites: All Year Three, Semester One courses Corequisites: 362 Imaging Procedures. II and Lab 378 Pathology in Imaging I

YEAR FOUR, SEMESTER ONE

0714-432 RADIATION PROTECTION AND RADIOBIOLOGY (2-0-2)

This course covers the biological effects of ionizing radiation in human tissue and its potential effects on the cellular, organ and systemic levels. It also covers the principles and applications of radiation protection and applicable regulations, including an awareness of how to apply the “As Low As Reasonably Achievable” (ALARA) principle to ionizing radiation exposure.

Prerequisites: All Year Three, Semester Two courses

0714-455 IMAGING PROCEDURES III AND LAB (2-3-3)

0714-

Presentation and demonstration of instrumentation and patient manipulation for diagnostic imaging of body systems.

Prerequisites: All Year Three, Semester Two courses Corequisite: 432

Radiation Protection and Radiobiology

466 COMPUTER APPLICATIONS IN IMAGING (2-3-3)

Computer management of information in imaging departments is covered. Computer acquisition and processing of images in Radiology. Demonstrations and laboratories will be conducted in the areas of image acquisition, reconstruction, processing, analysis, feature extraction, and related topics.

Prerequisites: All Year Three, Semester Two courses Corequisites: 481

Quality Assurance, 472 Clinical Practicum III

0714-481 QUALITY ASSURANCE (1-3-2)

Lecture and demonstration on the techniques of evaluating imaging and processing equipment for operation according to manufacturers' specifications in Radiography.

Prerequisites: All Year Three, Semester Two courses Corequisite: 472

Clinical Practicum III

0714-472 CLINICAL PRACTICUM III (0-20-5)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging and therapy. Emphasis is placed on competency evaluation of clinical practice.

Prerequisites: All Year Three, Semester Two courses Corequisites: 455

Imaging Procedures III and Lab 432 Radiation Protection and Radiobiology

YEAR FOUR, SEMESTER TWO**0714-450 SPECIAL IMAGING PROCEDURES (3-0-3)**

Lecture and film viewing demonstrating the imaging requirements and pathologic conditions of specialized examinations. The different imaging modalities in

0714-

Radiology will be presented demonstrating their unique imaging problems and their specific applications.

Prerequisites: All Year Four, Semester One courses Corequisite: 478

Pathology in Imaging II

478 PATHOLOGY IN IMAGING II (3-0-3)

The study of disease processes affecting the human body in relation to etiology, organ system involvement, pathological changes in the structure and function of tissues and organs, specific physical signs and symptoms, diagnostic procedures and common complications. The course also covers pathologic manifestations on the radiograph and the subsequent technical variation required to produce an optimal radiographic examination.

Prerequisites: All Year Four, Semester One courses Corequisite: None

0714-495 RESEARCH (2-3-3)

Students are exposed to the fundamental elements of the research process and embark on a small empirical project related to some aspect of the curriculum. The depth of study involved in the project will help them develop skills in independent learning.

Prerequisites: All Year Four, Semester One courses Corequisite: 473

Clinical Practicum IV

0714-473 CLINICAL PRACTICUM IV (0-24-6)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging and therapy. Emphasis is placed on competency evaluation of clinical practice and final competency evaluation. **Prerequisites: All Year Four, Semester One courses**

Corequisites: 450 Special Imaging Procedures 478 Pathology in Imaging II

TRACK II: NUCLEAR MEDICINE TECHNOLOGY

YEAR THREE, SEMESTER ONE

0715-354 IMAGING PROCEDURES I AND LAB (2-3-3)

Presentation and demonstration of instrumentation and patient manipulation for diagnostic imaging of body systems. **Prerequisites: All Year Two courses**

Corequisite: 374 Physics of Medical Imaging I and Lab

0715-356 CHEMISTRY FOR NUCLEAR MEDICINE (2-3-3)

This course provides students with the foundations of organic chemistry and biochemistry. The absorption, metabolism, and utilization of essential body nutrients at the cellular level are covered.

Prerequisites: All Year Two courses Corequisites: None

0715-365 DIGITAL IMAGING TECHNIQUES (2-3-3)

This course is an introduction to digital imaging techniques and their application to radiology and nuclear medicine. Didactic material is presented in the classroom and applications are investigated in the computer laboratory using commercial software. The fundamentals of spatial and grey-level quantization are reviewed. Students will analyse and implement various algorithms for image enhancement, selecting and using appropriate techniques. Image segmentation by thresholding and morphological operations is included. **Prerequisites: All Year Two courses**

Corequisites: 374 Physics of Medical Imaging I and Lab 354 Imaging Procedures I and Lab

0715-374 PHYSICS OF MEDICAL IMAGING I AND LAB (3-3-4)

The course explores the nature of particulate and electromagnetic radiation (with emphasis on x-rays & -rays, their production, interactions, detection and applications. Topic also include the structure and function of some equipment in the production of x-rays.

Prerequisites: All Year Two courses Corequisites: None

0715-370 CLINICAL PRACTICUM I (0-16-4)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging. Emphasis is placed on competency evaluation of clinical practice.

Prerequisites: All Year Two courses Corequisites: 354 Imaging Procedures I and Lab 374 Physics of Medical Imaging I and Lab

YEAR THREE, SEMESTER TWO

0715-332 RADIATION PROTECTION AND RADIOBIOLOGY (2-0-2)

This course covers the biological effects of ionizing radiation in human tissue and its potential effects on a cellular, organ and systemic levels. It also covers the principles and applications of radiation protection and applicable regulations, including an awareness of how to apply the “As Low As Reasonably Achievable” (ALARA) principle to ionizing radiation exposure.

Prerequisites: All Year Three, Semester One courses Corequisite: None

0715-362 IMAGING PROCEDURES II AND LAB (2-3-3)

Presentation and demonstration of instrumentation and patient manipulation for diagnostic imaging of body systems.

Prerequisites: All Year Three, Semester One courses Corequisites: 378 Pathology in Imaging 384 Physics of Medical Imaging II and Lab

0715-378 PATHOLOGY IN IMAGING I (3-0-3)

The study of disease processes affecting the human body in relation to etiology, organ system involvement, pathological changes in the structure and function of tissues and organs, specific physical signs and symptoms, diagnostic procedures and common complications. The course also covers pathologic manifestations on the radiograph and the subsequent technical variation required to produce an optimal radiographic examination.

Prerequisites: All Year Three, Semester One courses Corequisite: 384 Physics of Medical Imaging II and Lab

0715-384 PHYSICS OF MEDICAL IMAGING II AND LAB (2-3-3)

A continuation of Physics of Medical Imaging I. Topics include Physics of Imaging systems used in nuclear medicine.

**Prerequisites: All Year Three, Semester One courses Corequisite: 332
Radiation Protection and Radiobiology**

0715-371 CLINICAL PRACTICUM II (0-16-4)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging and therapy. Emphasis is placed on competency evaluation of clinical practice.

**Prerequisites: All Year Three, Semester One courses Corequisite: 362
Imaging Procedures II and Lab**

YEAR FOUR, SEMESTER ONE

0715-452 NUCLEAR PHARMACY & PHARMACOLOGY (2-3-3)

This course covers the theory and practice of radiopharmacy, including preparation and calculation of the dose to be administered, quality control, radiation safety, and applicable regulations. In addition, it deals with nonradioactive interventional drugs and contrast media that are used as part of nuclear medicine procedures. For all administered materials, it addresses the routes of administration, biodistribution mechanisms, interfering agents, contraindications and adverse effects. Experience in laboratories, a clinical setting, or a centralized radiopharmacy is an essential component of this course for students to become proficient in this area.

Prerequisites: All Year Three, Semester Two courses Corequisite: None

0715-455 IMAGING PROCEDURES III AND LAB (2-3-3)

Presentation and demonstration of instrumentation and patient manipulation for diagnostic imaging of body systems.

**Prerequisites: All Year Three, Semester Two courses Corequisite: 452
Nuclear Pharmacy and Pharmacology**

0715-466 COMPUTER APPLICATIONS IN IMAGING (2-3-3)

Computer management of information in imaging departments. Computer acquisition and processing of images in Radiology and Nuclear Medicine. Demonstrations and laboratories will be conducted in the areas of image acquisition, reconstruction, processing, analysis, feature extraction, and related topics.

**Prerequisites: All Year Three, Semester Two courses Corequisite: 472
Clinical Practicum III**

0715-482 QUALITY ASSURANCE (1-3-2)

Quality control tests in the evaluation of the imaging performance of Nuclear Medicine equipment are described. Laboratory exercises will develop skills required for performing these tests.

**Prerequisites: All Year Three, Semester Two courses Corequisites: 455
Imaging Procedures III and Lab 466 Computer Applications in Imaging**

0715-472 CLINICAL PRACTICUM III (0-20-5)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging and therapy. Emphasis is placed on competency evaluation of clinical practice.

**Prerequisites: All Year Three, Semester Two courses Corequisites: 455
Imaging Procedures III and Lab 452 Nuclear Pharmacy and Pharmacology**

YEAR FOUR, SEMESTER TWO

0715-450 SPECIAL IMAGING PROCEDURES (3-0-3)

Lecture and film viewing demonstrating the imaging requirements and pathologic conditions of specialized examinations. The different imaging modalities in Radiology will be presented demonstrating their unique imaging problems and their specific applications.

**Prerequisites: All Year Four, Semester One courses Corequisite: 478
Pathology in Imaging II**

0715-457 NON-IMAGING PROCEDURES (1-3-2)

The study of Nuclear Hematology including red cell mass, red cell survival, red cell sequestration, red and white blood cells tagging techniques, ferrokinetics, In-111

platelets, and In-111 leukocytes, and Carbon-14 urea breath test. Presentation and demonstration of Radionuclide therapy including therapeutic uses of different radiopharmaceuticals in Nuclear Medicine. **Prerequisites: All Year Four, Semester One courses**
Corequisite: 478 Pathology in Imaging II

0715-478 PATHOLOGY IN IMAGING II (3-0-3)

The study of disease processes affecting the human body in relation to etiology, organ system involvement, pathological changes in the structure and function of tissues and organs, specific physical signs and symptoms, diagnostic procedures and common complications. The course also covers pathologic manifestations on the radiograph and the subsequent technical variation required to produce and optimal radiographic examination.

Prerequisites: All Year Four, Semester One courses Corequisite: None

0715-495 RESEARCH (2-3-3)

Students are exposed to the fundamental elements of the research process and embark on a small empirical project, related to some aspect of the curriculum. The depth of study involved in the project will help them develop skills in independent learning.

Prerequisites: All Year Four, Semester One courses Corequisite: 473 Clinical Practicum IV

0715-473 CLINICAL PRACTICUM IV (0-24-6)

Supervised clinical participation through assigned modules of clinical experience in diagnostic imaging and therapy. Emphasis is placed on competency evaluation of clinical practice and final competency evaluation. **Prerequisites: All Year Four, Semester One courses**

Corequisite: 450 Special Imaging Procedures