

Ministry of Education
King Saud University (KSU)
Deanship of Graduate Studies



College of Applied Medical
Sciences
Department of Radiological
Sciences

Master of Sciences in Radiological Sciences

(Thesis Option / Non-thesis Option)

1438 / 1439 AH

2017 / 2018 G

- **Introduction:**

College of Applied Medical Sciences is one of the health colleges at King Saud University, was established in 1396 AH corresponding to 1977G. The College is the first applied medical science college established in the Kingdom and aims to prepare leading health professionals with high professional and research skills through providing distinguished academic programs according to quality standards.

The Department of Radiological Sciences was established in the College of Applied Medical Sciences in the year 1400AH corresponding to 1990 G. The undergraduate program in Radiological Sciences is the first program in the Middle East. Since its establishment, the program has graduated more than 1500 students. The program received international accreditation from the German Accreditation Commission for Health Sciences (AHPGS) in the year 2011.

Radiological science covers multiple techniques for the diagnosis of diseases affecting the human body, including diagnostic radiography, Nuclear Medicine(NM), ultrasound (US), Computerized Tomography (CT), and Magnetic Resonance Imaging (MRI), where technologists perform radiographic procedures, apply radiation protection principles, evaluates images quality with practicing profession and patient care. Technologists who graduated from the program can find jobs in hospitals, clinics, and industrial companies.

The Department of Radiological Sciences at the College of Applied Medical Sciences has the availability of qualified teaching staff and research laboratories that support the conduct of scientific research in various fields of specialization. Over the past five years, the department research groups have published more than 120 scientific papers in international scientific peer reviewed journals in the following fields:

- ❖ Nuclear medicine and Molecular Imaging
- ❖ Magnetic Resonance Imaging Technology
- ❖ Medical Ultrasonography
- ❖ Medical Radiation Protection

On the other hand, the health care sector in the Kingdom of Saudi Arabia, including the public and private sectors, reveals rapid growth in the number and type of health facilities, in particular the qualitative and quantitative developments in radiological sciences and medical imaging over the last decade. This program has been proposed to meet this need and meet the needs of the radiological sciences and medical imaging sector in Saudi Arabia.

- **Degree's Name:**

- ❖ Master of Sciences in Radiological Sciences (Nuclear medicine and Molecular Imaging)

- ❖ Master of Sciences in Radiological Sciences (Magnetic Resonance Imaging Technology)
- ❖ Master of Sciences in Radiological Sciences (Medical Ultrasonography)
- ❖ Master of Sciences in Radiological Sciences (Medical Radiation Protection)
- **Program's Language:**
 - ❖ English language
- **Significance and Justifications of Program Creation**
 1. High demand for the program to KSU department graduates, other department universities graduate, hospital staff in the field of radiological sciences.
 2. It is the first MSc program with the major tracks in the field of radiological sciences in governmental universities.
 3. Recommendations of the German Accreditation Programs agency in Health Sciences (AHPGS) to establish master and PhD programs in radiological sciences to fulfil the college's and department's mission (annex p. 42).
 4. The increase in the number and size of health care facilities in the public sector (including the ministry of health and other governmental agencies such as university and military hospitals)
 5. In order to fulfil the university strategic plan (KSU2030) as well as the college strategic plan, there is expansion in postgraduate programs in the College of Applied Medical Sciences in both sections, male and female.
 6. Effective utilization of the Radiological Sciences Department resources including faculty members and department facilities.
- **Program's Vision**

Regional leadership with International Reputation in Radiologic Sciences and Medical Imaging
- **Program's Mission**

To contribute in the advancement of Health care for the community through qualifying competitive professionals in Radiologic Sciences and Medical Imaging, to provide an environment that encourages learning and creativity, and to produce researches that contribute in building the knowledge community.
- **Program's Objectives**

The objectives for MSc program in radiological sciences are as follows:

 1. To provide in depth advanced knowledge and skills of radiological sciences in the field of subspecialty: nuclear Medicine and Molecular Imaging, MRI Technique, Diagnostic Medical US or Medical Radiation Protection.

2. To prepare the highly qualified graduates in the field of radiological sciences to contribute in fulfilling the new demands of radiological specialties in health sectors and academic radiological sciences departments in KSA.
3. To develop a generation of distinguished researchers in the field of radiological sciences.

- **Program's Outcomes**

- A- Knowledge and Comprehension:**

1. Acquiring advanced knowledge related to the subspecialty of radiological sciences in evidence-based practice.
2. Deepening knowledge that related to the subspecialty of radiological sciences.
3. Understanding the ethics of scientific research related to subspecialty of radiological sciences.

- B- Mental Skills:**

1. Strengthen fundamental skills in radiological sciences specialties for excellence in medical imaging technology specialists.
2. Optimal design of radiological sciences subspecialties protocols.
3. Identify, analyses, and solve problems related to the subspecialty of radiological sciences.

- C- Professional and Practical Skills:**

1. Effective performance of radiological sciences protocols related to the subspecialty.
2. Using up-to-date technologies and advanced experiences in radiological sciences subspecialty.
3. Professional management, teamwork and responsibility in the field of radiological sciences subspecialties
4. Applying the ethics of scientific research in the field of radiological sciences
5. Skills of effective teaching and training for students in the subspecialties of radiological sciences

- D- General Skills:**

1. Realize and expand new knowledge in radiological sciences specialties that contribute to improve the quality of health care.
2. Improve the leadership and education skills in the field of radiological sciences.
3. Effective communication and team-work with highly qualified medical staff

- **Program Beneficiaries:**

- ❖ Radiological Sciences Graduates
- ❖ Radiological Specialists in hospitals, medical institutions and research centers

- **Employment Opportunities Available:**

- ❖ Governmental and private Hospitals
- ❖ Public and Private Universities
- ❖ Health Research centers
- ❖ Health Institutions and Organizations

- **Admission Requirements**

In addition to the admission requirements mentioned in the unified regulations for graduate studies in Saudi universities and the organizational and executive rules and procedures for postgraduate studies at King Saud University, the department requires the following to enroll in the program:

1. Applicant must have a bachelor's degree in the field of Radiological Sciences from King Saud University or equivalent, at a cumulative average of not less than (3.75) or equivalent.
2. Obtaining a Professional Classification and Registration from the Saudi Commission for Health Specialties (SCHS).
3. Obtain a score of at least (45) in the TOEFL online test (IBT) or equivalent.
4. Pass the written test conducted by the department.
5. Pass the personal interview conducted by the department.

- **Requirements for obtaining the Degree:**

- ❖ **Thesis Option**

- Passing (27) study units of master's courses
- Successful completion of master's dissertation

- ❖ **Non-thesis option**

- Passing (32) study units of Master's courses including the research project

- **Program's Tracks:**

1. Nuclear medicine and Molecular Imaging
2. Magnetic Resonance Imaging Technology
3. Medical Ultrasonography
4. Medical Radiation Protection

- **Program General Structure:**

- ❖ **Thesis Option**

- Number of required units is (27) units in addition to (6) thesis units as follows:

Type of Courses	No. of Courses	No. of Units Required
Core courses	(9) courses for each Track	(24) Study unit
Elective courses	(1) for each Track	(3) Study unit
Thesis	(1)	(6) Study unit
Total	(11)	(27) Study unit + (6) study units for thesis

- ❖ **Non-thesis Option**

- Number of units required is (32) including the project as follows:

Type of Courses	No. of Courses	No. of Units Required
Core courses	(10) courses for each Track	(25) Study unit
Elective courses	(1) for each Track	(3) Study unit
Research project	(2)	(4) Study unit
Total	(13)	(32) Study unit

- **Study Plan for Program Tracks:**

- ❖ **Nuclear medicine and Molecular Imaging Track**

- A/ Thesis Option**

- **First Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non-Ionizing Radiation	3(2+2)	
Total			(9) Units	

- **Second Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	531 RAD	Radiopharmaceutical Sciences	3(2+2)	
Total			(8) Units	

- **Third Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	533 RAD	Radiation safety and dosimetry in NM	3(2+2)	513 RAD
2	535 RAD	Radionuclide therapy	3(2+2)	531 RAD
3	596 RAD	Thesis Proposal Preparation	One unit	(13) units
4	---- RAD	Elective Course (1)	3(2+2)	
Total			(10) Units	

- **Fourth Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	600 RAD	Thesis	(6) Units	596 RAD
Total			(6) Units	

- **List of elective courses (student must select single course from the following):**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	537 RAD	Advanced Clinical Nuclear Medicine	3(2+2)	
2	539 RAD	Preclinical NM Techniques	3(2+2)	

B/ Non-Thesis Option

○ First Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non-Ionizing Radiation	3(2+2)	
Total			(9) Units	

○ Second Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	531 RAD	Radiopharmaceutical Sciences	3(2+2)	
Total			(8) Units	

○ Third Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	533 RAD	Radiation safety and dosimetry in NM	3(2+2)	513 RAD
2	534 RAD	Seminar in Nuclear Medicine (1)	1(1+0)	
3	535 RAD	Radionuclide therapy	3(2+2)	531 RAD
4	598 RAD	Research Project (1)	2(2+0)	
Total			(9) Units	

○ Fourth Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	---- RAD	Elective Course (1)	3(2+2)	
2	536 RAD	Seminar in Nuclear Medicine (2)	1(1+0)	534 RAD
3	599 RAD	Research Project (2)	2(2+0)	598 RAD
Total			(6) Units	

○ List of elective courses (student must select single course from the following):

#	Course Code	Name	No. of Study Units	Pre-requisite
1	537 RAD	Advanced Clinical Nuclear Medicine	3(2+2)	
2	539 RAD	Preclinical NM Techniques	3(2+2)	

**❖ Study Plan for Magnetic Resonance Imaging Technology Track
A/ Thesis Option**

○ **First Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non-Ionizing Radiation	3(2+2)	
Total			(9) Units	

○ **Second Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	541 RAD	MRI Physics and instrumentation	3(2+2)	
Total			(8) Units	

○ **Third Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	543 RAD	Fundamental MRI procedures	3(2+2)	541 RAD
2	545 RAD	Body and Vascular MRI procedures	3(2+2)	541 RAD
3	596 RAD	Thesis Proposal Preparation	One unit	(13) units
4	---- RAD	Elective Course (1)	3(2+2)	
Total			(10) Units	

○ **Fourth Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	600 RAD	Thesis	(6) Units	596 RAD
Total			(6) Units	

○ **List of elective courses (student must select single course from the following):**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	547 RAD	Advanced Neurological MRI procedures	3(2+2)	
2	549 RAD	Advanced cardiovascular MRI procedures	3(2+2)	

B/ Non-Thesis Option

○ First Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non-Ionizing Radiation	3(2+2)	
Total			(9) Units	

○ Second Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	541 RAD	MRI Physics and instrumentation	3(2+2)	
Total			(8) Units	

○ Third Level

#	Course Code	Name	No. of Study Units	Pre-requisite
1	543 RAD	Fundamental MRI procedures	3(2+2)	541 RAD
2	544 RAD	Seminar in MRI (1)	1(1+0)	
3	545 RAD	Body and Vascular MRI procedures	3(2+2)	541 RAD
4	598 RAD	Research Project (1)	2(2+0)	
Total			(9) Units	

○ Fourth Level

#	Course Code	Name	No. of Study Units	Pre-requisite
1	---- RAD	Elective Course (1)	3(2+2)	
2	546 RAD	Seminar in MRI (2)	1(1+0)	544 RAD
3	599 RAD	Research Project (2)	2(2+0)	598 RAD
Total			(6) Units	

○ elective courses (student must select single course from the following):

#	Course Code	Name	No. of Study Units	Pre-requisite
1	547 RAD	Advanced Neurological MRI procedures	3(2+2)	
2	549 RAD	Advanced cardiovascular MRI procedures	3(2+2)	

❖ **Study Plan for Medical Ultrasonography Track**

A/ Thesis Option

#	Course Code	Name	No. of Study Units	Pre-requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non-Ionizing Radiation	3(2+2)	
Total			(9) Units	

○ **Second Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	551 RAD	Ultrasound Physics and instrumentation	3(2+2)	
Total			(8) Units	

○ **Third Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	553 RAD	Abdominal Sonography	3(2+2)	551 RAD
2	555 RAD	Superficial Parts Sonography	3(2+2)	551 RAD
3	596 RAD	Thesis Proposal Preparation	One unit	(13) units
4	---- RAD	Elective Course (1)	3(2+2)	
Total			(10) Units	

○ **Fourth Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	600 RAD	Thesis	(6) Units	596 RAD
Total			(6) Units	

○ **List of elective courses (student must select single course from the following):**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	557 RAD	Vascular Sonography	3(2+2)	
2	559 RAD	Obs/Gyn Sonography	3(2+2)	

B/ Non–Thesis Option

○ First Level:

#	Course Code	Name	No. of Study Units	Pre–requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non–Ionizing Radiation	3(2+2)	
Total			(9) Units	

○ Second Level:

#	Course Code	Name	No. of Study Units	Pre–requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	551 RAD	Ultrasound Physics and instrumentation	3(2+2)	
Total			(8) Units	

○ Third Level

#	Course Code	Name	No. of Study Units	Pre–requisite
1	553 RAD	Abdominal Sonography	3(2+2)	551 RAD
2	554 RAD	Seminar in Medical Ultrasound (1)	1(1+0)	
3	555 RAD	Superficial Parts Sonography	3(2+2)	551 RAD
4	598 RAD	Research Project (1)	2(2+0)	
Total			(9) Units	

○ Fourth Level

#	Course Code	Name	No. of Study Units	Pre–requisite
1	---- RAD	Elective Course (1)	3(2+2)	
2	556 RAD	Seminar in Medical Ultrasound (2)	1(1+0)	554 RAD
3	599 RAD	Research Project (2)	2(2+0)	598 RAD
Total			(6) Units	

○ List of elective courses (student must select single course from the following):

#	Course Code	Name	No. of Study Units	Pre–requisite
1	557 RAD	Vascular Sonography	3(2+2)	
2	559 RAD	Obs/Gyn Sonography	3(2+2)	

❖ Study Plan for Medical Radiation Protection Track
A/ Thesis Option

○ **First Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non-Ionizing Radiation	3(2+2)	
Total			(9) Units	

○ **Second Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	561 RAD	Instrumentations In Radiation Protection	3(2+2)	
Total			(8) Units	

○ **Third Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	563 RAD	Radiation Protection Legislation	3(2+2)	561 RAD
2	565 RAD	Dosimetry and Radiobiology	3(2+2)	561 RAD
3	596 RAD	Thesis Proposal Preparation	One unit	(13) units
4	---- RAD	Elective Course (1)	3(2+2)	
Total			(10) Units	

○ **Fourth Level:**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	600 RAD	Thesis	(6) Units	596 RAD
Total			(6) Units	

○ **List of elective courses (student must select single course from the following):**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	567 RAD	Radiation Protection in Diagnostic Radiology	3(2+2)	
2	569 RAD	Radiation Protection in Radiotherapy	3(2+2)	

B/ Non-Thesis Option

○ First Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	511 RAD	Pathophysiology	3(2+2)	
2	513 RAD	Radiation Detection and Measurements	3(2+2)	
3	515 RAD	Physical Principles of Non-Ionizing Radiation	3(2+2)	
Total			(9) Units	

○ Second Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	517 RAD	Medical Image Processing	3(2+2)	
2	519 RAD	Quality Assurance in Radiology	2(1+2)	
3	561 RAD	Instrumentations In Radiation Protection	3(2+2)	
Total			(8) Units	

○ Third Level:

#	Course Code	Name	No. of Study Units	Pre-requisite
1	563 RAD	Radiation Protection Legislation	3(2+2)	561 RAD
2	564 RAD	Seminar in Medical Radiation Protection (1)	1(1+0)	
3	565 RAD	Dosimetry and Radiobiology	3(2+2)	561 RAD
4	598 RAD	Research Project (1)	2(2+0)	
Total			(9) Units	

○ Fourth Level

#	Course Code	Name	No. of Study Units	Pre-requisite
1	---- RAD	Elective Course (1)	3(2+2)	
2	566 RAD	Seminar in Medical Radiation Protection (2)	1(1+0)	564 RAD
3	599 RAD	Research Project (2)	2(2+0)	598 RAD
Total			(6) Units	

○ List of elective courses (student must select single course from the following):

#	Course Code	Name	No. of Study Units	Pre-requisite
1	567 RAD	Radiation Protection in Diagnostic Radiology	3(2+2)	
2	569 RAD	Radiation Protection in Radiotherapy	3(2+2)	

- **Program Courses Description:**

- ❖ **General Courses**

511 RAD	Pathophysiology	3 (2+2)	Pre-requisite
<p>This course provides a deep understanding of the general concept of pathophysiology as a change from the normal physiological functioning of various human body systems. Also, it will cover the diagnosis and management of disease processes associated with pathophysiologic dysfunction and alterations.</p>			
513 RAD	Radiation Detection and Measurements	3 (2+2)	Pre-requisite
<p>This course provides in depth knowledge and technical skills required to understand, operate and utilize instruments and techniques important in the detection and measurement of ionizing radiation in radiation therapy, diagnostic imaging, and nuclear medicine.</p>			
515 RAD	Physical Principles of Non-Ionizing Radiation	3 (2+2)	Pre-requisite
<p>This course provides an overview of Non-ionizing radiation, including visible and non-visible (ultraviolet and infrared) light, lasers, Radio Waves and Microwaves and their application and interaction in biology and medicine.</p>			
517 RAD	Medical Image Processing	3 (2+2)	Pre-requisite
<p>This course covers the fundamentals of digital signal processing with particular emphasis on problems medical imaging modalities such as MRI, Ultrasound and Nuclear Medicine. It covers the principles and algorithms used in the processing and analysis of medical images. Topics include data acquisition, imaging, filtering, coding, feature extraction, segmentation and modeling.</p>			
519 RAD	Quality Assurance in Radiology	2 (1+2)	Pre-requisite
<p>This course presents systematic quality assurance in medical imaging settings, including quality control and quality administrative framework, the course introduces radiology equipment monitoring and testing essential to ensure persistence high quality images with minimum exposure to patient and staff.</p>			
596 RAD	Thesis Proposal Preparation	One unit	Pre-requisite
<p>Directing the student to select the subject of the thesis and define the research problem and assisting in the preparation of the research topic that has been chosen in accordance with the general framework of the research plan.</p>			(13) Units

600 RAD	Thesis	(6) study unit	Pre-requisite
<p>Students are encouraged to analyze and design, acquisition or construction of laboratory devices required for their thesis topics and materials. At every stage of research, lot of discussions with the faculty members, the supervisor of the thesis to guide students in the choice of methods of analysis and critique the search results and how to present and may publish them.</p>			596 RAD
598 RAD	Research Project (1)	2 (2+0)	Pre-requisite
<p>This course is designed to enable students to develop the necessary skills and competencies to undertake scientific research. Students will learn about Biostatistics and research methods and designs. It will also offer students an opportunity to select a special area of interest in the field of specialty for intensive research.</p>			
599 RAD	Research Project (2)	2 (2+0)	Pre-requisite
<p>This advanced level course requires students to complete a Radiologic Sciences in the field of specialty) research project and produce a substantial scholarly paper. It provides opportunity for critical analysis of published research and enables students to have a contribution to the body of professional literature.</p>			598 RAD

❖ Specialized Courses

A/ Nuclear Medicine and Molecular Imaging Track

531 RAD	Radiopharmaceutical Sciences	3 (2+2)	Pre-requisite
<p>This course covers the scientific principles of both diagnostic and therapeutic radio pharmaceuticals, including the production of radionuclides from cyclotrons, nuclear reactors and generators. Salient radiochemical processes and applications as well as radio pharmacological principles are also discussed. Sample clinical applications are introduced throughout the course.</p>			
533 RAD	Radiation safety and dosimetry in NM	3 (2+2)	Pre-requisite
<p>This course covers the physics of radiation safety in nuclear medicine and its clinical applications, regulatory statutes and guidelines. Topics also include internal radiation dosimetry of both particulate radiation used in radionuclides therapy and gamma photons in diagnosis with special emphasis on the medical internal radiation dosimetry method.</p>			513 RAD

534 RAD	Seminar in Nuclear Medicine (1)	1 (1+0)	Pre-requisite
<p>This course is designed to enable students to discuss and generate ideas on issues related to a variety of topics and trends in the field of Nuclear Medicine. Students will conduct an in-depth study of a research topic in the field of Nuclear Medicine, discuss issues with experts, work in discussion groups, debate and problem solve on selected issues in the field of Nuclear Medicine.</p>			
535 RAD	Radionuclide Therapy	3 (2+2)	Pre-requisite
<p>This course includes the physical basis and clinical applications of radionuclides therapy, specialty-focused nuclear imaging modalities such as scinti-mammography and lymphoscintigraphy. The scientific and technical principles and applications of image archiving and communication systems are also covered.</p>			531 RAD
536 RAD	Seminar in Nuclear Medicine (2)	1 (1+0)	Pre-requisite
<p>This course will be delivered by seminar-style presentation by academic and postgraduate students about current issues in the field of Nuclear Medicine to enable the students to learn from different styles of presentations and benefit from comments given during the seminars.</p>			534 RAD
537 RAD	Advanced Clinical NM	3 (2+2)	Pre-requisite
<p>This course covered the advanced nuclear medicine multimodality imaging such as SPECT/CT, PET/CT and PET/MRI with emphasis on the physical principles and instrumentation of each tomographic imaging modality as well as their clinical utility in the practice of evidence-based medicine.</p>			
539 RAD	Preclinical NM Techniques	3 (2+2)	Pre-requisite
<p>This course discusses the physical principles and instrumentation of small animal nuclear medicine modalities including SPECT and PET as well as their preclinical procedures and applications. Also, this course outlines in depth the experimental design and protocols as well as quantitative analysis and computational algorithms related to preclinical studies.</p>			

B/ Magnetic Resonance Imaging Technology Track

541 RAD	MRI Physics and instrumentation	3 (2+2)	Pre-requisite
<p>This course designed to provide students with the fundamental and advanced concepts of MRI physics and instrumentation. The contents include the relaxation mechanism, pulse sequences, images weighting, image reconstruction, data acquisition, k-space filling, and selection of the appropriate pulse sequence. Advanced physical principles are also addressed, including fast, ultrafast pulse sequences and parallel imaging. The course will also provide the introductory physical concepts of advanced MRI techniques such as diffusion weighted imaging, angiography and spectroscopy.</p>			
543 RAD	Fundamental MRI procedures	3 (2+2)	Pre-requisite
<p>This course designed to provide students with the basic and advanced knowledge and skills necessary to perform routine, modified and advanced MRI scanning protocols of the brain, spine and musculoskeletal examinations. Students are trained to scan independently and in a responsible manner. The course contents also include the principles of designing MRI protocols as well as comparisons between applied protocols in the MRI centers and literature.</p>			541 RAD
544 RAD	Seminar in MRI (1)	1 (1+0)	Pre-requisite
<p>This course designed to enable students to discuss and generate ideas on issues related to a variety of topics and trends in the field of MRI. Students will conduct an in-depth study of a research topic in the field of MRI, discuss issues with experts, work in discussion groups, debate and problem solve on selected issues in the field of MRI.</p>			
545 RAD	Body and Vascular MRI procedures	3 (2+2)	Pre-requisite
<p>This course designed to provide students with the basic and advanced knowledge and skills necessary to perform routine, modified and advanced MRI scanning protocols of abdomen pelvis organs as well as breast and vascular imaging,. Students are trained to scan independently and in a responsible manner. The course will cover the physical principles and clinical applications of magnetic resonance angiography (MRA).</p>			541 RAD
546 RAD	Seminar in MRI (2)	1 (1+0)	Pre-requisite
<p>This course will be delivered by seminar-style presentation by academic and postgraduate students about current issues in the field MRI to enable the students to learn from different styles of presentations and benefit from comments given during the seminars.</p>			544 RAD

547 RAD	Advanced Neurological MRI procedures	3 (2+2)	Pre-requisite
<p>This course designed to provide the basic physical principles and clinical applications of advanced neurological MRI techniques. Contents include; diffusion weighted imaging, perfusion weighted imaging and functional MRI as well as the principle of developing non-Cartesian k-space filling will be reviewed, including spiral, radial (PROPELLR) trajectories with emphasis on data acquisition, image reconstruction, post-processing and analysis.</p>			
549 RAD	Advanced cardiovascular MRI procedures	3 (2+2)	Pre-requisite
<p>This course designed to provide the basic physical principles and clinical applications of cardiac MRI. Topics covered will include the various cardiac imaging pulse sequences with an emphasis on how to reduce motion artifact during structure and dynamic cardiac imaging. The students will be provided with several clinical examples and situations to supplement and enrich the theoretical background of the course.</p>			

C/ Medical Ultrasonography Track

551 RAD	Ultrasound Physics and instrumentation	3 (2+2)	Pre-requisite
<p>This course introduces students to the fundamentals of physics and instruments used in medical ultrasound. Topics include; The ultrasound machine components, transducer function and types with emphasis on image formation, processing, recording and optimization methods. Different scanning modes as well as new advances in medical ultrasonography are also covered.</p>			
553 RAD	Abdominal Sonography	3 (2+2)	Pre-requisite
<p>This course provides students with the required knowledge and skills to perform advanced sonography of the abdomen organs in an independent and responsible manner. Topics include exam preparation, clinical applications as they correlated to patient history and the disease process as well as the study of normal and the pathological appearance of abdominal structures as related to scanning techniques.</p>			551 RAD
554 RAD	Seminar in Medical Ultrasound (1)	1 (1+0)	Pre-requisite
<p>This course is designed to enable students to discuss and generate ideas on issues related to a variety of topics and trends in the field of Medical Ultrasound. Students will conduct an in-depth study of a research topic in the field of Medical Ultrasound, discuss issues with experts, work in discussion groups, debate and problem solve on selected issues in the field of Medical Ultrasound.</p>			

555 RAD	Superficial Parts Sonography	3 (2+2)	Pre-requisite
<p>This course provides students with the required knowledge and skills to perform an advanced sonographic examination of superficial parts of the body in an independent and responsible manner. Topics include exam preparation, clinical applications as they correlated to patient history and the disease process as well as the study of normal and the pathological sonographic appearance of superficial structures as related to scanning techniques, (Pre-requisite: 551 RAD).</p>			551 RAD
556 RAD	Seminar in Medical Ultrasound (2)	1 (1+0)	Pre-requisite
<p>This course will be delivered by seminar-style presentation by academic and postgraduate students about current issues in the field Medical Ultrasound to enable the students to learn from different styles of presentations and benefit from comments given during the seminars.</p>			554 RAD
557 RAD	Vascular Sonography	3 (2+2)	Pre-requisite
<p>This course provides students with the required knowledge and skills to perform advanced vascular sonographic examinations in an independent and responsible manner. Topics include cerebrovascular, peripheral arterial and peripheral venous studies and with emphasis on exam preparation, clinical applications as they correlated to patient history and the disease process as well as the study of normal and the pathological sonographic appearance of superficial structures as related to scanning techniques.</p>			
559 RAD	Obs/Gyn Sonography	3 (2+2)	Pre-requisite
<p>This course provides students with the required knowledge and skills to perform advanced sonographic examinations in the field of obstetrics and gynecology in an independent and responsible manner. Topics include exam preparation, clinical applications as they correlated to patient history and the disease process as well as the study of normal and pathological sonographic appearance in obstetrics and gynecology as related to scanning techniques</p>			

D/ Medical Radiation Protection Track

561 RAD	Instrumentations in Radiation Protection	3 (2+2)	Pre-requisite
<p>This course aims to prepare students to monitor and control radiation exposure processing in health care, work, and natural environments. Topics include the construction and function of dosimetry instrumentations including GM counter, scintillator detectors, proportional counter and semiconductor detector as well as personal dosimeters.</p>			

563 RAD	Radiation Protection Legislation	3 (2+2)	Pre-requisite
<p>This course is designed to give students the necessary knowledge of the legislations in radiation protection as recommended by the International Commission on Radiological Protection (ICRP). The course will focus on the methods and techniques of protecting the Staff and Public against ionizing radiation.</p>			561 RAD
564 RAD	Seminar in Medical Radiation Protection (1)	1 (1+0)	Pre-requisite
<p>This course is designed to enable students to discuss and generate ideas on issues related to a variety of topics and trends in the field of Medical Radiation Protection. Students will conduct an in-depth study of a research topic in the field of Medical Radiation Protection, discuss issues with experts, work in discussion groups, debate and problem solve on selected issues in the field of Medical Radiation Protection.</p>			
565 RAD	Dosimetry and Radiobiology	3 (2+2)	Pre-requisite
<p>This course provides the necessary principles and applications of radiation protection with the emphasis on radiation dose to the wider population and individuals, the principles of dose calculation, procedures for implementing radiation protection programs. This course also focuses on the effect of radiation on the biological molecules, the normal human cells, and the cancer cells.</p>			561 RAD
566 RAD	Seminar in Medical Radiation Protection (2)	1 (1+0)	Pre-requisite
<p>This course will be delivered by seminar-style presentation by academic and postgraduate students about current issues in the field Medical Radiation Protection to enable the students to learn from different styles of presentations and benefit from comments given during the seminars.</p>			564 RAD
567RAD	Radiation Protection in Diagnostic Radiology	3 (2+2)	Pre-requisite
<p>This course provides students with core knowledge and skills based on clinical practice and the latest and evolving techniques and procedures of medical radiation protection in diagnostic imaging technologies such as mammography, CT and SPECT/CT. Detailed Quality Control principles and procedures of major diagnostic radiology equipment as well as optimal design of diagnostic radiology facilities will be covered.</p>			

569 RAD	Radiation Protection in Radiotherapy	3 (2+2)	Pre-requisite
<p>The course provides students with core knowledge and skills, based on clinical practice, and the latest and evolving techniques and procedures of medical radiation protection in radiotherapy technologies. Detailed Quality Control principles and procedures of major radiotherapy equipment as well as optimal design of radiotherapy facilities will be covered.</p>			