

Course Description

III. Professional Courses

76 credits

MTRD 201 Radiation Physics

2(2-0-4)

Mechanism of the radiation emission, physical properties and factors affecting radiation beam quality, interactions of various radiations with matters associated with medicine, applying the physical properties of radiation to radiodiagnosis, including physical and statistical principles of the resultant quality analysis.

MTRD 202 Instrumentation in Diagnostic Radiology

1(1-0-2)

Equipment in the diagnostic radiology, installation standards and safety, features of diagnostic radiology equipment such as x-rays, mammography, fluoroscopy, ultrasound, computed tomography and magnetic resonance imaging and preventive maintenance of radiology equipment.

MTRD 203 Introduction to Radiation Protection

1(1-0-2)

Basic principles of radiation protection (ALARA) and basic safety standards for protecting against the ionizing radiation and radiation sources, effects of radiation, radiation units and quantities, limitation of radiation dose for the radiation workers and the public, principles of radiation detection and monitoring instruments.

MTRD 205 Radiation Dosimetry

2(2-0-4)

Radiation physical properties of photons, electrons and other particles, radiation units, definitions and recommendations for radiation quantities and dose calculation, radiation dosimeters and methods of measuring radiation doses.

MTRD 209 Digital Electronics for Radiological Technologist

1(1-0-2)

Digital electronics circuit analysis, analog and digital signals, digital electronics components design and testing, circuit simulation software, programming microcontroller, basic maintenance in radiology instruments.

MTRD 210 Transformative Learning for Radiological Technologist

2(2-0-4)

Self-reflection, rational discourse on causes and effects of events/situations/ problems and information technology, skills to live with others in harmony, mutual recognition in diversity, ethical rules for radiological technologists and their application to daily life.

MTRD 221 Information and Communication Technology for Radiological Technologists

3(3-0-6)

Computer and Information technologies in radiological technology, computer hardware and peripheral devices, basic data communication, telecommunication technology, computer network, internet technology, computer network devices, DICOM standard, picture archiving and communication system, computer security, related ethic and law in information technology.

MTRD 222 Radiographic Photography and Exposure Technique

2(1-3-3)

Principles of radiographic imaging and exposure techniques, factors affecting the image quality and patient dose, the basis of patient dose measurement and calculation, practice in radiographic photography of phantom.

- MTRD 223 Quality Control in Diagnostic Radiology** 2(1-2-3)
Quality control in diagnostic radiology according to the role of radiological technologists in various imaging machines, such as, x-ray machine and imaging equipment, ultrasound machine, computed tomography, and magnetic resonance imaging.
- MTRD 224 Medical Image Processing** 2(1-3-3)
Basic medical image processing and related mathematics, image enhancement, image restoration, filtering in spatial domain and frequency domain, morphological image processing, image reconstruction, three-dimensional visualization, geometric transformation, image registration, and image fusion.
- MTRD 301 Diagnostic Radiographic Technique I** 2(1-3-3)
Relationship among anatomy, surface anatomy, and nomenclature related to standard radiographic positioning. Basic patient preparation and communication, routine radiographic positioning techniques, image evaluation criteria, and normal radiographic anatomy of upper and lower extremities.
- MTRD 302 Diagnostic Radiographic Technique II** 2(1-3-3)
Relationship among anatomy, surface anatomy, and nomenclature related to standard radiographic positioning. Basic patient preparation and communication, routine radiographic positioning techniques, image evaluation criteria, and normal radiographic anatomy of upper and lower extremities.
- MTRD 303 Diagnostic Radiographic Technique III** 2(1-3-3)
Relationship among anatomy, surface anatomy, and physiology, patient preparation, routine radiographic positioning techniques, image evaluation criteria, and normal radiographic anatomy of pelvis, hip, abdomen, KUB, portable, pediatric, orthopedic, and dental imaging. Radiopathology and image interpretation of musculoskeletal (MSK) system, chest, cardiac, abdominal, and KUB radiography.
- MTRD 304 Clinical Practice in Diagnostic Radiology I** 3(0-12-3)
Clinical practicum in general radiographic techniques in the assigned radiology department in the hospital.
- MTRD 305 Patient Care and Radiological Service Management** 2(1-2-3)
Vital sign assessment, emergency patient care, etiquette and communication with patients, safety patient transfer, infection control, patients' right, techniques of sterilization and disinfection, health care team, radiological service management.
- MTRD 321 Pathology** 3(2-2-5)
Basic pathology of diseases and common systemic pathology
- MTRD 322 Sectional Radiological Imaging** 2(2-0-4)
The relationship between anatomy and sectional images in the transverse, sagittal, and coronal planes of head, neck, thorax, abdomen, pelvis and extremities on standard procedures in computed tomography, magnetic resonance imaging and ultrasound.
- MTRD 323 Contrast Radiological Procedures** 2(2-0-4)

Instrumentation and tools for special radiological procedures, contrast media and adverse effects, patient preparation and care, techniques in fluoroscopic procedures, diagnostic and therapeutic angiography, cardiac catheterization, and quality administration.

MTRD 324 Introduction to Medical Mammography and Ultrasonography 1(1-0-2)

Basic physics and instrumentation of mammography and ultrasonography. Anatomy of the breast and pathology, imaging techniques, ultrasonography and MRI of the breast. Imaging methods and scanning techniques in abdominal imaging, breast and thyroid, reproductive organs, obstetric ultrasonography, vascular ultrasound, musculoskeletal ultrasound.

MTRD 325 Computed Tomography for Radiological Technologist 2(2-0-4)

Basic physics concepts, instrumentation, data acquisition, image reconstruction, post-processing, imaging procedures and imaging protocols in head and neck, spine and musculoskeletal system, abdomen, pelvis and other special applications, pathologic correlation.

MTRD 326 Magnetic Resonance Imaging for Radiological Technologist 2(2-0-4)

Basic physics concepts, instrumentation, data acquisition, image reconstruction techniques, post-processing, imaging procedures, and imaging protocols in head and neck, spine and musculoskeletal system, abdomen, pelvis and other special applications, pathologic correlation.

MTRD 327 Clinical Practice in Diagnostic Radiology II 3(0-12-3)

Clinical practicum in special radiographic techniques in the assigned radiology department in the hospital, special techniques in contrasted procedures, computed tomography, observation of special techniques in interventional radiology, mammography, ultrasonography and magnetic resonance imaging

MTRD 341 Instrumentation in Nuclear Medicine 3(2-2-5)

Overviews of radiation physics, components and principles of radiation detectors, radionuclide counting and nuclear medicine imaging systems, three dimensional image reconstructions, Monte Carlo simulation in nuclear medicine, PACS in nuclear medicine.

MTRD 342 Nuclear Medicine 3(3-0-6)

Radiopharmaceuticals and radionuclide production, radiochemical impurity, clinical nuclear medicine, radiation safety and radioactive waste management in nuclear medicine.

MTRD 343 Imaging Technique and Quality Control of Instrumentation in Nuclear Medicine 3(2-2-5)

Patient positioning and imaging technique, imaging protocols, image manipulation such as zoom, image addition and subtraction etc., quantitative analysis for diagnosis, quality control of instrumentation.

MTRD 344 Clinical Practice in Nuclear Medicine I 3(0-12-3)

Clinical practice in general nuclear medicine such as patient positioning, imaging protocols, quantitative analysis, image display etc. for gamma camera, SPECT, SPECT/CT and basic imaging technique for PET/CT.

MTRD 359 Term Paper I 1(1-0-2)

Introduction to research methodology, searching, literature reviews, statistical analysis, research ethics in human beings, and plagiarism.

MTRD 401 Radiobiology

2(2-0-4)

Basic cell biology, interactions of radiation on living organisms, cellular and molecular response ionizing radiation, reaction of radiation to cells, tissues and organs, acute and late reactions of radiation, radiation effect on genetics and major organs, radiation effects of embryo and fetus, tumor and cancer biology and the application of radiation biology in medicine.

MTRD 402 Instrumentation in Radiotherapy

2(2-0-4)

Types, components and functions of radiotherapy machines such as kilovoltage and megavoltage equipment, particle beam therapy units, brachytherapy units, simulators, integrated treatment devices, computerized treatment planning system, beam modifiers, patient positioning and immobilization devices, radiotherapy imaging and application, image guided radiation therapy, and the role of the radiation therapists in the quality assurance in radiotherapy.

MTRD 403 Radiation Dosimetry and Treatment Technique in Radiotherapy 3(2-2-5)

Basic principles of the radiation dosimetry, recommendations for radiation quantities, radiation dosimeters, method of radiation measurements, principle of treatment planning and patient dose calculation, dose distribution in patients with brachytherapy, and external beam therapy for photons, electrons and other particles, and radiation protection in radiotherapy.

MTRD 404 Radiotherapeutic Technique and Clinical application for Upper Body

2(2-0-4)

Types and staging of cancers, pathology, epidemiology, signs and symptoms, incidence and risk factors, diagnostic and treatment of cancer by radiation, advantage, disadvantage and complications from radiotherapy treatment, patient positioning and immobilization, simulation techniques, treatment planning techniques, delivery techniques, patient care and advice given to patients and people involved during the radiotherapy treatment of central nervous system malignancies, head and neck cancer, lung cancer, breast cancer and upper gastrointestinal cancer.

MTRD 405 Radiotherapeutic Technique and Clinical application for Lower Body

2(2-0-4)

Types and staging of cancers, pathology, epidemiology, signs and symptoms, incidence and risk factors, diagnostic and treatment of cancer by radiation, advantage, disadvantage and complications from radiotherapy treatment, patient positioning and immobilization, simulation techniques, treatment planning techniques, delivery techniques, patient care and advice given to patients and people involved during the radiotherapy treatment of lower abdomen cancer, sarcoma, pediatric malignancies, haematological malignancies, emergency conditions and other kinds of cancer.

MTRD 406 Clinical Practice in Radiotherapy I

3(0-12-3)

Clinical practice in radiation therapy, the process of radiotherapy treatment from patient positioning, immobilization, simulation, basic treatment planning, clinical treatment by external beam therapy and brachytherapy units, care of the patients during the radiation

treatment, radiation protection, quality assurance in radiotherapy machines in the role of a radiation technologist.

MTRD 451 Law for Radiological Technologist **1(1-0-2)**

The Act of Parliament, the Law of medicine and public health, the Compliance risk, the Code of Ethics.

MTRD 452 Moral and Code of Ethics in Radiological Technology **1(1-0-2)**

Compassion, caring, empathy, sympathy, respect and the uses of the Code of Ethics based on the virtue and ethical standards.

MTRD 453 Medical Radiation Protection **2(2-0-4)**

Protection against ionizing and non-ionizing radiation used in medicine, biological consequences of human radiation exposure, protection and safety of the radiation worker, patient and public concerned, radiation protection related to exposure in pregnancy, recommendation and regulation in the radiation protection, instruments and detection devices in the radiation protection, personal radiation monitoring, emergency planning and preparation for accidents in radiation, radiation safety acts and regulation, national and international agency regulations in the radiation protection.

MTRD 459 Term Paper II **1(0-6-1)**

Basic methodology of interesting research, literature reviews, data collection, method, data analysis and conclusion, writing term papers and presentations.

IV. Specialized practice for RT

MTRD 454 Clinical Practice in Diagnostic Radiology III **3(0-12-3)**

Clinical practicum in special radiographic techniques selected by the student in the assigned diagnostic radiology department, ultrasonography, computed tomography, magnetic resonance imaging, and interventional radiology.

MTRD 455 Clinical Practice in Nuclear Medicine II **3(0-12-3)**

Clinical practice in general nuclear medicine, SPECT/CT and PET/CT professional skills for problem solving and clinical application in nuclear medicine.

MTRD 456 Clinical Practice in Radiotherapy II **3(0-12-3)**

Clinical practice in radiation therapy; Principle of advanced radiation techniques: image guided radiotherapy, total body irradiation with photon beams, total body skin irradiation with electron beams, intensity modulated radiotherapy, volumetric arc therapy, stereotactic radiosurgery, stereotactic radiotherapy, stereotactic body radiotherapy, critical organ delineation in radiation treatment planning image and dose calculation by using computerized treatment planning system.

MTRD 457 Computer Applications in Radiological Technology **1(1-0-2)**

Application software, current application software in radiological technology, data, information and application of information, information system development concept, flowchart, data type and operation, flow control and repetition.

MTRD 458 Current Topics in Database Technology for Radiological Technologists 2(2-0-4)

Basic data processing concept, appropriate data collection, universal data source, current database technology, basic database system, database design, database implementation, data representation, report generation, data filtering

MTRD 460 Molecular Technology and Applications in Medical Imaging and Radiation Therapy 3(2-2-5)

Concept of molecular technology, such as molecular nanotechnology, application of molecular nanotechnology in medical imaging, application of molecular nanotechnology in combination with radiation for therapy, other related technologies in imaging and therapy.

V. Free Elective 6 credits

MTRD 225 Innovation in Radiology 2(2-0-4)

Description of innovation and innovator, innovation management, related conceptual frameworks in innovation development, current innovation trend, innovations and related technologies in radiological technology, innovation project in the radiological technology.

MTRD 226 Basic Molecular Technique and Its Application in Radiological Technology 1(1-0-2)

Basic molecular techniques, understanding of fundamental molecular mechanism and interaction as well as applications related to radiological technology.

MTRD 306 Professional Communication 1(0-2-1)

Practice of listening and speaking skills in foreign languages for communicating in the profession work.

MTRD 307 Advanced Techniques in Medical Image Processing 1(1-0-2)

Advanced techniques in medical image processing, three-dimensional visualization, image segmentation, image analysis, feature extraction, and feature recognition.