

# Radiation Sciences

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**Undergraduate major:** radiation sciences (BS)

**Website:** <https://medicine.uiowa.edu/radsci/>

Radiation sciences professionals work with physicians to gather accurate patient information for diagnosis, treatment, and/or research of disease and injury. They provide direct patient care, produce quality images, and deliver treatment using a variety of radiation sources. The radiation sciences professional must apply knowledge, skill, and mature judgment while operating complex equipment safely and efficiently. Strong communication, organizational, and patient care skills are essential for a successful career in radiation sciences.

The University of Iowa's radiation sciences educational programs are designed to provide students with opportunities for intellectual, professional, and social growth. Students learn with faculty members and instructors who are committed to radiation sciences education.

Radiation sciences is one of two undergraduate majors in the field of medical imaging offered by the Carver College of Medicine. It encompasses radiologic technology, breast imaging, computed tomography, magnetic resonance imaging, cardiovascular interventional, diagnostic medical sonography, and radiation therapy programs. The other undergraduate major in medical imaging is nuclear medicine technology; see Nuclear Medicine Technology in the catalog.

The Carver College of Medicine is located on the University of Iowa health sciences campus, which includes University of Iowa Health Care, one of the nation's largest university-owned teaching hospitals. For information about the college's academic programs and resources, see Carver College of Medicine in the catalog.

UI Health Care and the Carver College of Medicine have a proud academic tradition of preparing students for successful careers in the radiation sciences. Today, that tradition continues through its strong curriculum, quality clinical experience, and commitment to undergraduate education in the creation of images and treatment of patients using highly sophisticated equipment and techniques.

The Carver College of Medicine, in partnership with the Department of Radiology, is committed to equal access and, consistent with its academic mission and standards, strives to achieve excellence through the advancement of diversity. The Carver College of Medicine recognizes and values all aspects

of human difference, defining diversity in the broadest sense. Its programs strive to create a welcoming culture.

## Programs

### Undergraduate Program of Study

#### Major

- Major in Radiation Sciences (Bachelor of Science)

#### Courses

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### Breast Imaging Courses

#### **RSBI:3310 Patient Care for Breast Imaging** 3 s.h.

Foundation for providing high-quality patient care during breast imaging exams and procedures; patient communication, assessment, and treatment options including surgical, nonsurgical, and reconstruction. Requirements: acceptance to radiation sciences RT degree track or ARRT primary certification in radiography.

#### **RSBI:3315 Breast Imaging Clinical Internship I** 2 s.h.

Breast imaging clinical internship practicum at UI Health Care; rotation through department imaging rooms; competency and objective-based education with required clinical performance evaluations; participation in routine and advanced breast imaging exams; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:3225. Requirements: radiation sciences major.

#### **RSBI:4110 Breast Imaging Procedures and Analysis** 3 s.h.

Breast imaging exams including technique, image evaluation, and positioning. Prerequisites: RSBI:3310. Requirements: acceptance to radiation sciences RT/BI track or ARRT primary certification in radiography.

#### **RSBI:4115 Breast Imaging Clinical Internship II** 4 s.h.

Breast imaging clinical internship scheduled at University of Iowa Health Care; rotation through department imaging rooms; competency and objective-based education with required clinical performance evaluations; experience facilitated by breast imaging technologists, radiologists, residents, and clinical coordinator; participation in routine and advanced breast imaging exams; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSBI:3315. Requirements: radiation sciences major.

#### **RSBI:4120 Anatomy and Pathology for Breast Imaging** 2 s.h.

Anatomy, localization terminology, histology, and cytology; pathology including mammographic appearance and reporting terminology; benign, high risk, and malignant conditions and their mammographic appearances.

**RSBI:4130 Breast Imaging Acquisitions and Principles** 2 s.h.

Physics and hardware used in obtaining exams in breast imaging; equipment operations including design characteristics of mammography units, digital acquisition, display, and informatics.

**RSBI:4210 Breast Imaging Advanced Procedures and Analysis** 3 s.h.

Advanced breast imaging modalities including breast sonography, breast MRI, sentinel node mapping, and interventional procedures. Prerequisites: RSBI:4110.

**RSBI:4215 Breast Imaging Clinical Internship III** 4 s.h.

Breast imaging clinical internship scheduled at University of Iowa Health Care; rotation through department imaging rooms; competency and objective-based education with required clinical performance evaluations; experience facilitated by breast imaging technologists, radiologists, residents, and clinical coordinator; participation in routine and advanced breast imaging exams; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSBI:4115.

**RSBI:4220 Quality Control in Breast Imaging** 3 s.h.

Quality control aspects related to breast imaging; quality assurance and evaluation including accreditation, certification, and Mammography Quality Standards Act (MQSA) regulations; quality control including mammographers tests and digital quality control tests; medical physicist test including general quality control tests and quality control tests specific to digital imaging and tomosynthesis. Prerequisites: RSBI:4130.

**RSBI:4308 Breast Imaging Practicum** 1-6 s.h.

Breast imaging clinical internship scheduled at University of Iowa Health Care; rotation through department imaging rooms; competency and objective-based education with required clinical performance evaluations; experience facilitated by breast imaging technologists, radiologists, residents, and clinical coordinator; participation in routine and advanced breast imaging exams; performance expectations become progressively higher as students gain experience and skills. Requirements: admission to Radiation Sciences RT to BS online track.

**Cardiovascular Interventional Courses****RSCI:4110 Vascular Anatomy** 3 s.h.

Normal arterial and venous anatomy of the circulatory system illustrated through angiographic, magnetic resonance imaging (MRI), and computed tomography (CG) images; common variants. Prerequisites: ACB:3110 or HHP:2100 or HHP:3105 or HHP:3115.

**RSCI:4120 CVI Principles** 4 s.h.

Imaging and accessory equipment for vascular interventional and cardiac interventional procedures; imaging equipment quality control; fundamental principles of vascular and cardiac procedures; patient preparation and care, radiation safety, contrast medium, pharmacology, and sedation. Requirements: acceptance to BS radiation science RT/CVI track or ARRT primary RT certification.

**RSCI:4130 Electrocardiogram and Hemodynamics** 3 s.h.

ECG analysis, hemodynamic principles and waveform analysis, cardiac output, vascular resistance, calculations of stenotic valves. Prerequisites: ACB:3110 or HHP:2100 or HHP:3105 or HHP:3115.

**RSCI:4140 CVI Peripheral Procedures and Pathology** 3 s.h.

Angiographic and interventional procedures of the abdomen, thorax, and upper and lower extremities; associated pathologies. Prerequisites: RSCI:4110. Corequisites: RSCI:4120, if not taken as a prerequisite. Requirements: RSCI:4110 or three months CVI experience.

**RSCI:4150 CVI Neurology and Nonvascular Procedures and Pathology** 3 s.h.

Angiographic and interventional procedures of the head and neck; associated pathologies. Prerequisites: RSCI:4110. Corequisites: RSCI:4120, if not taken as a prerequisite. Requirements: RSCI:4110 or three months CVI experience.

**RSCI:4160 CVI Cardiac Procedures and Pathology** 4 s.h.

Cardiac diagnostic and interventional procedures; associated pathologies. Prerequisites: RSCI:4110. Corequisites: RSCI:4120 and RSCI:4130, if not taken as prerequisites. Requirements: RSCI:4110 or three months CVI experience.

**RSCI:4170 CVI Clinical Internship III** 4 s.h.

Cardiac-interventional clinical time scheduled at University of Iowa Health Care; rotations in adult cardiac, electrophysiology, and pediatric catheterization; competency and objective-based education provided with clinical performance evaluations and constructive feedback from CI staff and clinical coordinator; clinical coordinator facilitates schedules, rotations, learning objectives, evaluations, and competencies. Prerequisites: RSCI:4180. Corequisites: RSCI:4130 and RSCI:4160, if not taken as prerequisites. Requirements: acceptance to BS radiation sciences RT/CVI track.

**RSCI:4180 CVI Clinical Internship II** 4 s.h.

Vascular-interventional clinical time scheduled at University of Iowa Health Care; labs specialize in peripheral, neuro- and non-vascular procedures; competency and objective-based education; clinical performance evaluations providing constructive feedback from VI staff and clinical coordinator; clinical coordinator facilitates schedules, rotations, learning objectives, evaluations, and competencies. Prerequisites: RSCI:4190. Corequisites: RSCI:4140 and RSCI:4150, if not taken as prerequisites. Requirements: acceptance to BS radiation sciences RT/CVI track.

**RSCI:4190 CVI Clinical Internship I** 2 s.h.

Introduction to VI and CI labs including basic set up, equipment, and procedures; preparation to spend more concentrated time in each area for future internships; provides 192 hours of clinical experience over a 12-week period. Prerequisites: RSRT:3225. Requirements: acceptance to radiation sciences RT/CVI degree track or CVI clinical internship.

**RSCI:4308 Cardiovascular Interventional Practicum** 1-6 s.h.

Cardiac-interventional (CI) clinical time scheduled at University of Iowa Health Care; rotations in adult cardiac, electrophysiology, and pediatric catheterization; competency and objective-based education provided with clinical performance evaluations and constructive feedback from CI staff and clinical coordinator; clinical coordinator facilitates schedules, rotations, learning objectives, evaluations, and competencies. Requirements: admission to Radiation Sciences RT to BS online track.

## Computed Tomography Courses

### **RSCT:4100 Sectional Anatomy for Imaging Sciences** 3 s.h.

Sectional anatomy identifiable on computed tomography and magnetic resonance imaging, including transverse, coronal, and sagittal planes. Prerequisites: ACB:3110 or HHP:2100 or HHP:3105 or HHP:3115.

### **RSCT:4105 Computed Tomography Clinical Internship I** 2 s.h.

Clinical internship scheduled at University of Iowa Health Care; rotation through CT scanners, 3D lab, and radiation therapy departments; competency and objective-based education with required clinical performance evaluations; clinical coordinator facilitates schedules, rotations, learning objectives, evaluations, and competencies; experience facilitated by CT technologists, radiologists, residents, and coordinator; participation in routine and advanced CT scans; performance expectations become progressively higher as student gains experience and skills. Prerequisites: RSRT:3225. Requirements: acceptance to BS radiation sciences RT/CT track.

### **RSCT:4115 Computed Tomography Clinical Internship II** 4 s.h.

CT scanners, 3D lab, and radiation therapy department rotation at University of Iowa Health Care; competency and objective-based education with required clinical performance evaluations; clinical coordinator facilitates schedule, rotations, learning objectives, evaluations, and competencies; experience facilitated by CT technologists, radiologists, residents, and coordinator; participation in routine and advanced CT scans; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSCT:4105.

### **RSCT:4120 Computed Tomography Procedures I** 4 s.h.

Computed tomography procedures of the head, neck, thorax, mediastinum, abdomen, and pelvis; positioning techniques, patient preparation, monitoring and care, indications and contraindications for procedures; contrast media usage; basic protocol information with adjustments to tailor procedures for patient's indications; brief units on patient care relevant to CT; CT parameters and equipment. Corequisites: RSCT:4100. Requirements: acceptance to BS radiation sciences RT/CT track or ARRT primary certification in radiologic technology, nuclear medicine, or radiation therapy.

### **RSCT:4125 Computed Tomography Procedures II** 4 s.h.

Imaging information in musculoskeletal exams, 3D reconstruction, CTAs; cardiac; CT arthrography, PET/CT, SPECT/CT, virtual colonoscopy; procedure indications and contraindications, patient and room preparation, positioning techniques, contrast media usage, and scan parameters; basic protocol information and how to tailor procedures to a patient's indications; information in common pathological conditions found in CT images and protocol appearance variations. Prerequisites: RSCT:4120. Corequisites: RSCI:4110, if not taken as a prerequisite.

### **RSCT:4130 Computed Tomography Physical Principles and QC** 4 s.h.

Physical principles and instrumentation; historical development and evolution of CT; characteristics of radiation, beam attenuation, linear attenuation coefficients, tissue characteristics, Hounsfield numbers, data acquisition, image manipulation techniques, tube configuration, collimation design and function, detectors, image quality factors, functions of CT computer and array processor; image processing and display examined from data acquisition through postprocessing and archiving; radiation protection practices and QC. Requirements: acceptance to BS radiation sciences RT/CT degree track or ARRT primary certification in radiologic technology, nuclear medicine, or radiation therapy.

### **RSCT:4215 Computed Tomography Clinical Internship III** 4 s.h.

CT scanners, 3D lab, and radiation therapy department rotation at University of Iowa Health Care; competency and objective-based education with required clinical performance evaluations; clinical coordinator facilitates schedule, rotations, learning objectives, evaluations, and competencies; experience facilitated by CT technologists, radiologists, residents, and coordinator; participation in routine and advanced CT scans; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSCT:4115.

### **RSCT:4308 Computed Tomography Practicum** 1-6 s.h.

Computed Tomography (CT) scanners, 3D lab, and radiation therapy department rotation at University of Iowa Health Care; competency and objective-based education with required clinical performance evaluations; clinical coordinator facilitates schedule, rotations, learning objectives, evaluations, and competencies; experience facilitated by CT technologists, radiologists, residents, and coordinator; participation in routine and advanced CT scans; performance expectations become progressively higher as students gain experience and skills. Requirements: admission to Radiation Sciences RT to BS online track.

## Diagnostic Medical Sonography Courses

### **RSMS:3100 Cardiac Sonography I** 3 s.h.

Anatomy and physiology of cardiovascular system imaged sonographically; proper sonographic imaging techniques, normal anatomy, exam protocol, and proper instrument settings; pathology and pathophysiology of common conditions related to adult cardiovascular system. Prerequisites: RSMS:3110 with a minimum grade of C.

### **RSMS:3101 Cardiac Sonography I Lab** 2 s.h.

Laboratory-based learning and simulation experience involving basic sonographic adult cardiac imaging and clinical history analysis; students perform sonographic exams utilizing scanning simulation to develop skills in sonographic anatomy recognition, scan plane orientation, transducer manipulation, instrumentation, and exam protocols. Prerequisites: RSMS:3111 with a minimum grade of C. Corequisites: RSMS:3100.

### **RSMS:3110 Foundations of Sonography** 3 s.h.

Sonography history, ergonomics, terminology, image orientation; basic theories of sound waves, echo production, transducers, equipment operation, body imaging, Doppler, hemodynamics.

- RSMS:3111 Foundations of Sonography Lab** 1 s.h.  
Sonography history, ergonomics, terminology, image orientation; basic theories of sound waves, echo production, transducers, equipment operation, body imaging, Doppler, and hemodynamics. Corequisites: RSMS:3110.
- RSMS:3115 Diagnostic Medical Sonography Clinical Internship I** 1 s.h.  
Introductory clinical experience in health care setting developing a basic understanding of sonography clinical environment and professional practice standards; applying patient care techniques and developing professional communication skills.
- RSMS:3120 Abdominal Sonography I** 3 s.h.  
Embryology, anatomy, and physiology of various abdominal structures imaged sonographically; abdominal vasculature, hepatobiliary system, pancreas, urinary system, adrenals, spleen, male anatomy; proper sonographic imaging techniques, including appearance of normal anatomy, imaging protocol, proper instrument settings. Prerequisites: RSMS:3110 with a minimum grade of C.
- RSMS:3121 Abdominal Sonography I Lab** 1 s.h.  
Laboratory-based learning and simulation experience in sonographic abdominal imaging; students perform exams utilizing scanning simulation to develop skills in sonographic anatomy recognition, scan plane orientation, transducer manipulation, instrumentation, and exam protocols. Prerequisites: RSMS:3111 with a minimum grade of C. Corequisites: RSMS:3120.
- RSMS:3130 Obstetrical and Gynecological Sonography I** 3 s.h.  
Embryology, anatomy, and physiology of the female reproductive system and developing fetus; proper sonographic imaging techniques, including appearance of normal anatomy, imaging protocol, proper instrument settings. Prerequisites: RSMS:3110 with a minimum grade of C.
- RSMS:3131 Obstetrical and Gynecological Sonography I Lab** 1 s.h.  
Laboratory-based learning and simulation experience involving basic sonographic obstetrical and gynecological imaging and clinical history analysis; students perform sonographic exams utilizing scanning simulation to develop skills in sonographic anatomy recognition, scan plane orientation, transducer manipulation, instrumentation, and exam protocols. Prerequisites: RSMS:3111 with a minimum grade of C. Corequisites: RSMS:3130.
- RSMS:3140 Vascular Sonography I** 3 s.h.  
Anatomy and physiology of peripheral and cerebral vascular systems; analysis of hemodynamics, Doppler waveforms, pressure measurements, plethysmography, sonographic appearance, scanning techniques; evaluation of pathology and pathophysiology common to the lower extremity arterial and venous systems, and cerebrovascular system. Prerequisites: RSMS:3110 with a minimum grade of C.
- RSMS:3141 Vascular Sonography I Lab** 1 s.h.  
Laboratory-based learning and simulation experience involving basic vascular sonographic imaging and clinical history analysis; students perform non-imaging vascular physiologic tests and sonographic exams utilizing scanning simulation to develop skills in sonographic anatomy recognition, scan plane orientation, transducer manipulation, instrumentation, and exam protocols. Prerequisites: RSMS:3111 with a minimum grade of C. Corequisites: RSMS:3140.
- RSMS:3150 Cardiac Physiology and Hemodynamics** 3 s.h.  
Analysis of cardiac physiology and hemodynamics related to sonography; correlation with Doppler application in cardiovascular imaging, ECG, auscultation, cardiac catheterization; advanced and developing imaging techniques.
- RSMS:3205 Cardiac Sonography II** 3 s.h.  
Sonographic evaluation of advanced pathophysiology of human heart; sonographic appearance, imaging techniques, and exam modification. Prerequisites: RSMS:3100.
- RSMS:3206 Cardiac Sonography II Lab** 1 s.h.  
Laboratory-based learning and simulation experience involving the application of advanced sonographic cardiac imaging and clinical history analysis. Prerequisites: RSMS:3101. Corequisites: RSMS:3205.
- RSMS:3215 Diagnostic Medical Sonography Clinical Internship II** 3 s.h.  
Application of basic skills of sonographic imaging and physiologic vascular testing in the health care setting.
- RSMS:3230 Sonography Principles, Physics, and Instrumentation** 3-4 s.h.  
Physical principles of sound waves, their applications to imaging of the human body, operation and physical characteristics of various ultrasound transducers, method by which the sound wave is converted into a visual image, instrumentation components and their functions, Doppler principles, image artifacts, advanced hemodynamics, and spectral Doppler waveform analysis. Prerequisites: RSMS:3110.
- RSMS:3231 Sonography Principles, Physics, and Instrumentation Lab** 1 s.h.  
Laboratory-based learning and simulation experience in the application of sonographic imaging emphasizing physics principles, instrumentation, and quality assurance testing. Corequisites: RSMS:3230.
- RSMS:3240 Abdominal Sonography II** 3 s.h.  
Pathology and pathophysiology of abdominal and superficial structures imaged sonographically; interventional sonographic procedures; post-procedure protocol; associated clinical and laboratory findings; imaging techniques, analysis of findings, and documentation of pathology. Prerequisites: RSMS:3120.
- RSMS:3250 Obstetrical and Gynecological Sonography II** 3 s.h.  
Sonographically related pathological and abnormal congenital conditions of gynecology and obstetrics, infertility, assisted reproductive therapy, invasive procedures in obstetrics and gynecology, postpartum complications and maternal-fetal bonding; clinical findings, laboratory studies, and prognosis correlated with sonographic findings; appropriate image analysis and documentation of pathology. Prerequisites: RSMS:3130.
- RSMS:3260 Breast Sonography** 2 s.h.  
Embryology, anatomy, physiology, and pathophysiology of the breast as it relates to sonographic imaging; proper sonographic imaging techniques, including appearance of normal anatomy, imaging protocol, proper instrument settings; sonographic findings of diseases involving the breast.

- RSMS:3270 Vascular Sonography II** 3 s.h.  
Pathology and pathophysiology of complex diseases of the peripheral, cerebral, and abdominal vascular systems evaluated sonographically; associated clinical findings; techniques in physiologic, nonimaging tests, and duplex sonography; analysis of findings and documentation of pathology. Prerequisites: RSMS:3140.
- RSMS:3300 Pediatric Sonography** 3 s.h.  
Anatomy, sonographic anatomy, pathophysiology, sonographic appearance, and Doppler correlation of disorders affecting the pediatric population, including abdominal, musculoskeletal, peripheral vascular, and cerebrovascular systems, neonatal brain and spinal cord.
- RSMS:3305 Pediatric Cardiac Sonography** 3 s.h.  
Anatomy, sonographic anatomy, pathophysiology, sonographic appearance, and Doppler correlation of disorders affecting the pediatric cardiac population; associated clinical findings; techniques in sonographic imaging, analysis of findings, and documentation of pathology. Prerequisites: RSMS:3205. Requirements: completion of or current enrollment in a diagnostic medical sonography program.
- RSMS:3306 Pediatric Cardiac Sonography Laboratory** 1 s.h.  
Laboratory-based learning and simulation experience involving basic sonographic pediatric cardiac imaging and clinical history analysis; students perform sonographic exams utilizing scanning simulation to develop skills in sonographic anatomy recognition, scan plane orientation, transducer manipulation, instrumentation, and exam protocols. Corequisites: RSMS:3305. Recommendations: completion of or current enrollment in a diagnostic medical sonography program.
- RSMS:3315 Diagnostic Medical Sonography Clinical Internship III** 3 s.h.  
Application of sonographic imaging and physiologic vascular testing skills in health care setting; students develop competency in basic exams.
- RSMS:3325 Abdominal Sonography II Lab** 1 s.h.  
Laboratory-based learning and simulation utilizing computer-aided learning and scanning simulation to develop skills in interventional sonographic procedures with real-time ultrasound guidance; advanced abdominal and superficial structure imaging; exploring case studies; image analysis in identifying pathologies and differential diagnoses. Prerequisites: RSMS:3121.
- RSMS:3376 Vascular Sonography II Lab** 1 s.h.  
Laboratory-based learning and simulation experience to develop skills in advanced sonographic imaging of the vascular system and performance of advanced nonimaging vascular physiologic tests; analysis of findings and documentation of pathology. Prerequisites: RSMS:3141.
- RSMS:4110 Advanced Sonography** 3 s.h.  
Exploration of advanced sonographic imaging techniques and new technologies. Prerequisites: (RSMS:3240 with a minimum grade of C and RSMS:3250 with a minimum grade of C and RSMS:3270 with a minimum grade of C) or (RSMS:3205 with a minimum grade of C and RSMS:3270 with a minimum grade of C).
- RSMS:4111 Advanced Sonography Lab** 1 s.h.  
Laboratory-based learning and simulated application of advanced sonographic imaging techniques and new technologies. Prerequisites: (RSMS:3325 with a minimum grade of C and RSMS:3376 with a minimum grade of C) or (RSMS:3206 with a minimum grade of C and RSMS:3376 with a minimum grade of C). Corequisites: RSMS:4110.
- RSMS:4115 Diagnostic Medical Sonography Clinical Internship IV** 5 s.h.  
Application of sonographic imaging and physiologic vascular testing skills in the health care setting; students develop competency in high-level procedures. Prerequisites: RSMS:3315 with a minimum grade of C and RSMS:3376 with a minimum grade of C.
- RSMS:4120 Advanced Cardiac Sonography** 3 s.h.  
Advanced cardiac sonographic imaging techniques, quantifications, and new technologies; analysis of applications and limitations of imaging techniques. Prerequisites: RSMS:3205 with a minimum grade of C and RSMS:3270 with a minimum grade of C.
- RSMS:4121 Advanced Cardiac Sonography Lab** 1 s.h.  
Laboratory-based learning and simulated application of advanced cardiac sonographic imaging techniques, quantifications, and new technologies. Prerequisites: RSMS:3206 with a minimum grade of C. Corequisites: RSMS:4120.
- RSMS:4210 Fetal Cardiac Sonography** 3 s.h.  
Anatomy, sonographic anatomy, pathophysiology, sonographic appearance, and Doppler correlation of disorders affecting the fetal cardiac population; associated clinical findings; techniques in sonographic imaging, analysis of findings, and documentation of pathology. Prerequisites: RSMS:4110. Recommendations: sonography students, sonographers, and physicians with foundational knowledge in routine screening fetal heart sonographic evaluation.
- RSMS:4215 Diagnostic Medical Sonography Clinical Internship V** 5 s.h.  
Application of sonographic imaging and physiologic vascular testing skills in health care setting; students develop advanced skills. Prerequisites: RSMS:4115 with a minimum grade of C and RSMS:4110 with a minimum grade of C and RSMS:4111 with a minimum grade of C.
- RSMS:4220 Multidisciplinary Capstone Seminar** 3 s.h.  
Case-based learning; students analyze and synthesize data, determine proper course of action, and evaluate outcomes; preparation for professional work environment. Prerequisites: RSMS:4110.
- RSMS:4230 Musculoskeletal Sonography** 3 s.h.  
Anatomy, sonographic anatomy, pathophysiology, sonographic appearance, and Doppler correlation of disorders affecting the musculoskeletal system; associated clinical findings; techniques in sonographic imaging, analysis of findings, and documentation of pathology. Prerequisites: RSMS:4110. Recommendations: sonography students, sonographers, physicians, and other health professionals with foundational knowledge in sonographic imaging.

## Magnetic Resonance Imaging Courses

### **RSMR:4110 Fundamentals for the MRI Technologist**

3 s.h.

Caregiving skills specific to patients undergoing MRI examinations, including techniques in effectively communicating for safety and comfort; maintaining patient and personnel safety; patient preparation, monitoring, and venipuncture; technologist's role in a wide variety of MRI examinations and patient conditions. Requirements: acceptance to BS radiation sciences RT/MRI track or ARRT primary certification in radiologic technology, nuclear medicine, sonography, or radiation therapy.

### **RSMR:4120 MRI Procedures I**

4 s.h.

Imaging techniques related to central nervous and musculoskeletal systems; specific clinical applications; available coils and their use; considerations in imaging parameters; specific choices in protocols and positioning criteria; anatomical structures and the plane that best demonstrates anatomy; signal characteristics of normal and abnormal structures; information on common pathological conditions found in MRI images and protocol appearance variations. Prerequisites: RSCT:4100 and RSMR:4110. Requirements: concurrent registration in RSMR:4110, if not taken as a prerequisite; or three months MRI experience.

### **RSMR:4130 MRI Procedures II**

4 s.h.

MRI techniques related to neck, thorax, breast, abdomen, and pelvis; specific clinical applications; available coils and their use; considerations in imaging parameters; specific choices in protocols and positioning criteria; information on common pathological conditions found in MRI images and protocol appearance variations. Prerequisites: RSMR:4120.

### **RSMR:4140 MRI Acquisition and Principles I**

3 s.h.

Physics and hardware used in obtaining a magnetic resonance signal, including magnetism, NMR signal production, tissue characteristics, spatial localization, pulse sequencing, imaging parameters and options, and special applications; exploration of skills useful in maximizing MR image quality. Prerequisites: RSMR:4110. Requirements: concurrent registration in RSMR:4110, if not taken as a prerequisite; or three months MRI experience.

### **RSMR:4150 MRI Acquisition and Principles II**

3 s.h.

Advanced MRI techniques; MR angiography and further investigation of fast image acquisition sequences; overview of MR magnets, installation, operation, and facility design; computers and digital image acquisition as they apply to MR; outline of quality assurance procedures. Prerequisites: RSMR:4140.

### **RSMR:4160 MRI Clinical Internship I**

2 s.h.

Application of magnetic resonance imaging skills in health care setting; development of competency in high-level procedures and protocols. Prerequisites: RSRT:3225. Corequisites: RSMR:4110, if not taken as a prerequisite. Requirements: acceptance to BS radiation sciences RT/MRI track.

### **RSMR:4170 MRI Clinical Internship II**

4 s.h.

MRI clinical internship scheduled at University of Iowa Health Care; rotation through each MRI department scanning room; competency and objective-based education with required clinical performance evaluations; clinical preceptor facilitates schedules, rotations, learning objectives, evaluations, and competencies; experience facilitated by MRI technologists, radiologists, residents, and preceptor; participation in routine and advanced MRI scans; performance expectations become progressively higher as student gains experience and skills. Prerequisites: RSMR:4160. Corequisites: RSMR:4140, if not taken as a prerequisite. Requirements: acceptance to BS radiation sciences RT/MRI track.

### **RSMR:4175 MRI Clinical Internship III**

4 s.h.

Rotation through MRI department scanning rooms at University of Iowa Health Care; competency and objective-based education with required clinical performance evaluations; clinical preceptor facilitates schedules, rotations, learning objectives, evaluations, and competencies; experience facilitated by MRI technologists, radiologists, residents, and preceptor; participation in routine and advanced MRI scans; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSMR:4170.

### **RSMR:4308 Magnetic Resonance Imaging Practicum**

1-6 s.h.

Rotation through MRI department scanning rooms at University of Iowa Health Care; competency and objective-based education with required clinical performance evaluations; clinical preceptor facilitates schedules, rotations, learning objectives, evaluations, and competencies; experience facilitated by MRI technologists, radiologists, residents, and preceptor; participation in routine and advanced MRI scans; performance expectations become progressively higher as students gain experience and skills. Requirements: admission to Radiation Sciences RT to BS online track.

## Radiation Sciences Courses

### **RSP:1100 Introduction to the Radiation Sciences**

1 s.h.

Exploration of radiation sciences field (radiologic technology, nuclear medicine and PET, diagnostic medical sonography, radiation therapy, computed tomography, magnetic resonance imaging, cardiovascular interventional); introduction to basic principles and modalities associated with the field in preparation for application to radiation sciences or nuclear medicine technology major.

### **RSP:2110 Pathology for Radiation Sciences**

2 s.h.

Broad overview of common human diseases for the radiation sciences professional. Emphasis on disease prevalence, morbidity and mortality, risk factors, diagnosis, treatment, and prevention strategies. Fundamental vocabulary and concepts, basic disease processes, and the role of medical imaging and therapy in the diagnosis and treatment of disease are explored.

### **RSP:2120 Patient Care for the Radiation Sciences**

3 s.h.

Foundation for providing care to clients during radiographic examinations; taking medical histories, basic life support, medical emergencies, vital sign assessment, body mechanics, infection control, sterile techniques, intravenous equipment, administration; advance concepts in client assessment and monitoring, including evaluation and monitoring of clients in pain, and clients in acute and chronic states of illness; communication techniques, role playing. Requirements: acceptance to radiation science degree track.

**RSP:3130 Introduction to Radiation Safety and Radiobiology****1 s.h.**

Instruction on safe operation of radiation producing equipment and handling of radioactive materials; origin and/or derivation of certain formulae and techniques useful in radiation protection programs; regulatory agencies, regulations, and regulatory guides pertinent to student's field; emphasis on applied aspects of radiation protection; characteristics and biological effects of ionizing radiations, properties and uses of radioisotopes, medical applications, and biological basis for protection procedures. Requirements: enrollment in radiation sciences or nuclear medicine technology program. Same as FRRB:3130.

**RSP:3210 Medical Ethics and Law****2 s.h.**

Introduction to ethical reasoning and problem solving; integration of knowledge about patient care and ethical/legal issues which occur in process of providing care; ethical principles of autonomy, beneficence, justice, nonmaleficence, paternalism, Patient's Bill of Rights, resolving moral dilemmas; legal principles of malpractice, intentional torts, negligence. Requirements: radiation science or nuclear medicine technology major.

**RSP:3220 Radiation Sciences Quality Management and Health Care Administration****2 s.h.**

Introduction to quality management and health care administration topics relevant for the radiation sciences professional. Students are introduced to quality improvement tools, methodologies utilized in healthcare projects, health care economics, coding, and reimbursement. Students learn how medical informatics and artificial intelligence impact the field of medical imaging and therapy.

**RSP:4110 Research Methodology for Radiation Sciences****3 s.h.**

Introduction to research concepts and methods for the radiation science professional. Requirements: radiation sciences or nuclear medicine technology major.

## Radiation Therapy Courses

**RSTH:3100 Introduction to Radiation Therapy****2 s.h.**

Introduction to cancer as a disease; defining methods to treat cancer with emphasis on radiation therapy; simulation, planning, and treatment delivery of radiation therapy. Requirements: acceptance to radiation sciences therapy program.

**RSTH:3101 Introduction to Radiation Therapy Lab I****1 s.h.**

Provides students with the fundamental concepts and techniques used in radiation therapy. Students will gain knowledge and hands-on experience with radiation therapy equipment and procedures, learning how to safely and effectively deliver radiation treatments. Key topics include patient safety and communication, treatment room orientation, patient positioning, imaging, workflow, and radiation safety.

**RSTH:3110 Medical Physics I****1-3 s.h.**

Introduction to radiation used in clinical setting; fundamental physical units, measurements, principles, atomic structure and types of radiation; X-ray generating equipment, X-ray production, and its interaction with matter. Requirements: admission to free radical and radiation biology program or acceptance to radiation sciences therapy program, and maxillofacial or radiation oncology resident. Same as FRRB:3110.

**RSTH:3120 Radiation Therapy Clinical Internship I****3 s.h.**

Student rotations through different radiation therapy related areas; assist, practice, and test radiation therapy principles learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Requirements: acceptance to radiation sciences therapy program.

**RSTH:3132 Radiobiology in Radiation Therapy****1 s.h.**

Continuation of RSP:3130; geared towards students enrolled in the radiation therapy program.

**RSTH:3205 Principles of Radiation Therapy I****3 s.h.**

Didactic and laboratory work in principles of radiation therapy; historic and current aspects of cancer treatment; role of radiation therapist; patient care, treatment delivery accessories, tumor localization treatment delivery protocols. Prerequisites: RSTH:3100. Requirements: enrollment in radiation sciences therapy program.

**RSTH:3206 Principles of Radiation Therapy I Lab****1 s.h.**

Provides students with the fundamental knowledge and techniques used in radiation therapy. Students gain hands-on experience with radiation therapy equipment and treatment procedures, learning how to safely and effectively deliver radiation treatments covered in the didactic portion of the course. Additionally, students learn about topics related to radiation physics, treatment planning, patient positioning, special procedures, patient education, and chart checks. Prerequisites: RSTH:3100.

**RSTH:3215 Medical Physics II****0-3 s.h.**

Treatment units used in external radiation therapy; beam calculations, isodose distributions, brachytherapy, quality assurance and quality management, protection and safety. Prerequisites: RSTH:3110. Requirements: admission to free radical and radiation biology program or acceptance to radiation sciences therapy program. Same as FRRB:3215.

**RSTH:3225 Radiation Therapy Clinical Internship II****3 s.h.**

Student rotations through different radiation therapy related areas; assist, practice, and test radiation therapy principles learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSTH:3120. Requirements: acceptance to radiation sciences therapy program.

**RSTH:3325 Radiation Therapy Clinical Internship III****4 s.h.**

Student rotations through different radiation therapy related areas; assist, practice, and test radiation therapy principles learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSTH:3225. Requirements: acceptance to radiation sciences therapy program.

**RSTH:4105 Principles of Radiation Therapy II 2 s.h.**

Evaluation and management of neoplastic disease using knowledge in arts and sciences; critical thinking and basis of ethical clinical decision-making; epidemiology, etiology, detection, diagnosis, patient condition, treatment and prognosis of neoplastic disease. Prerequisites: RSTH:3205. Requirements: enrollment in radiation sciences therapy program.

**RSTH:4125 Radiation Therapy Clinical Internship IV 4 s.h.**

Student rotations through different radiation therapy related areas; assist, practice, and test radiation therapy principles learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSTH:3325. Requirements: acceptance to radiation sciences therapy program.

**RSTH:4225 Radiation Therapy Clinical Internship V 5 s.h.**

Student rotations through different radiation therapy related areas; assist, practice, and test radiation therapy principles learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSTH:4125. Requirements: acceptance to radiation sciences therapy program.

**RSTH:4230 Radiation Therapy Capstone 3 s.h.**

Professional development; review of concepts. Prerequisites: RSTH:4105. Requirements: acceptance to radiation sciences therapy program.

## Radiologic Technology Courses

**RSRT:2120 Radiologic Technology Clinical Internship I 1 s.h.**

Student rotations through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Requirements: acceptance to radiation sciences RT/CT, CVI, or MRI degree track.

**RSRT:2130 Radiographic Procedures I 2 s.h.**

Introduction to radiographic positioning principles; technical and positioning information needed to perform radiographic imaging of chest and abdomen on adult and pediatric patients; emphasis on quality patient care and adaptation to a variety of client conditions. Corequisites: RSRT:2140 and RSRT:2141.

**RSRT:2140 Radiographic Analysis I 1 s.h.**

Introduction to radiographic analysis principles; technical, positioning, and analysis information needed to evaluate images of chest and abdomen on adult and pediatric patients; emphasis on quality patient care and adaptation to a variety of client conditions. Corequisites: RSRT:2130 and RSRT:2141.

**RSRT:2141 Radiographic Procedures and Analysis I Lab 1 s.h.**

Introduction to radiographic procedures and analysis principles; technical, positioning, and analysis information needed to evaluate images of the chest and abdomen on adult and pediatric patients; emphasis on quality patient care and adaptation to a variety of client conditions; lab bridges didactic and clinical learning. Corequisites: RSRT:2130 and RSRT:2140.

**RSRT:2225 Radiologic Technology Clinical Internship II 3 s.h.**

Student rotation through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:2120.

**RSRT:2230 Radiographic Procedures II 3 s.h.**

Technical and radiographic positioning information needed to perform images of upper and lower extremity; emphasis on quality patient care and adaptation to a variety of client conditions. Prerequisites: RSRT:2130.

**RSRT:2240 Radiographic Analysis II 2 s.h.**

Radiographic procedure and image analysis information needed to evaluate images of upper and lower extremity and shoulder; emphasis on quality patient care and adaptation to a variety of client conditions; labs. Prerequisites: RSRT:2140.

**RSRT:2241 Radiographic Procedures and Analysis II Lab 1 s.h.**

Introduction to radiographic procedures and analysis principles; technical, positioning, and analysis information needed to evaluate images of upper and lower extremity and skull on adult and pediatric patients; emphasis on quality patient care and adaptation to a variety of client conditions; lab bridges didactic and clinical learning. Corequisites: RSRT:2230 and RSRT:2240.

**RSRT:2250 Radiographic Fluoroscopic Procedures 2 s.h.**

Technical, radiographic positioning, and analysis information needed to perform radiographic procedures that utilize fluoroscopy; emphasis on quality patient care and adaptation to a variety of client conditions. Prerequisites: RSRT:2130 and RSRT:2140.

**RSRT:2251 Radiographic Fluoroscopic Procedures Lab 1 s.h.**

Introduction to technical, radiographic positioning, and analysis information needed to perform radiographic procedures that utilize fluoroscopy; emphasis on quality patient care and adaptation to a variety of client conditions; lab bridges didactic and clinical learning. Corequisites: RSRT:2250.

**RSRT:2325 Radiologic Technology Clinical Internship III 3 s.h.**

Student rotation through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:2225.



**RSRT:3110 Radiographic Analysis III 1 s.h.**

Introduction to radiographic analysis principles; technical, positioning, and analysis information needed to evaluate images of hip, pelvis, spine, thorax, and skull on adult and pediatric patients; emphasis on quality patient care and adaptation to a variety of client conditions. Corequisites: RSRT:3111 and RSRT:3120.

**RSRT:3111 Radiographic Procedures and Analysis III Lab 1 s.h.**

Introduction to radiographic procedures and analysis principles; technical, positioning, and analysis information needed to evaluate images of hip, pelvis, spine, thorax, and skull on adult and pediatric patients; emphasis on quality patient care and adaptation to a variety of client conditions; lab bridges didactic and clinical learning. Corequisites: RSRT:3110 and RSRT:3120.

**RSRT:3120 Radiographic Procedures III 2 s.h.**

Introduction to radiographic positioning principles; technical and positioning information needed to perform radiographic imaging of hip, pelvis, spine, thorax, and skull on adult and pediatric patients; emphasis on quality patient care and adaptation to a variety of client conditions. Prerequisites: RSRT:2230 and RSRT:2240. Corequisites: RSRT:3110 and RSRT:3111.

**RSRT:3125 Radiologic Technology Clinical Internship IV 4 s.h.**

Student rotation through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:2325.

**RSRT:3132 Radiation Safety in Radiologic Technology 1 s.h.**

Continuation of RSP:3130; geared towards students enrolled in the radiologic technology program.

**RSRT:3140 Radiographic and Digital Imaging 3 s.h.**

Factors that govern and influence production of radiographic image; X-ray and scatter production; patient interactions; function of kVp, mAs, and distance as applied to contrast and spatial resolution; practical issues concerning automatic exposure control and grid usage.

**RSRT:3141 Radiographic and Digital Imaging Lab 1 s.h.**

Introduction to factors that govern and influence production of radiographic image; X-ray and scatter production; patient interactions; function of kilovoltage peak (kVp), milli-ampere-second (mAs), and distance as applied to contrast and spatial resolution; practical issues concerning automatic exposure control and grid usage; labs for practice and application of theoretical principles associated with production of quality images. Corequisites: RSRT:3140.

**RSRT:3220 Emotional Intelligence for the Health Care Professional 2 s.h.**

Introduction to emotional intelligence; scientific background for why emotional intelligence exists and exploring its applications to the health care setting; connection of emotional intelligence to interactions that occur between health care professional and their patients, patient families, and coworkers.

**RSRT:3225 Radiologic Technology Clinical Internship V 3 s.h.**

Student rotation through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:3125.

**RSRT:3230 Radiographic Physics and Imaging Equipment 3 s.h.**

Characteristics of atomic structure, electricity, and X-ray machines; properties of X-rays and their interaction with matter; measurement of radiation exposure; construction principles and theories of operation of specialized imaging equipment, including fundamentals of acquisition for imaging intensification, geometric tomography, mobile/portable radiography, and magnification principles.

**RSRT:3231 Radiographic Physics and Imaging Equipment Lab 1 s.h.**

Introduction to characteristics of atomic structure, electricity, and X-ray machines; properties of X-rays and their interaction with matter; measurement of radiation exposure; construction principles and theories of operation of specialized imaging equipment including fundamentals of acquisition for imaging intensification, geometric tomography, mobile/portable radiography, and magnification principles; labs for practice and application of theoretical principles. Corequisites: RSRT:3230.

**RSRT:3325 Radiologic Technology Clinical Internship VI 2 s.h.**

Student rotation through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:3225.

**RSRT:4125 Radiologic Technology Clinical Internship VII 1 s.h.**

Student rotation through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:3325.

**RSRT:4225 Radiologic Technology Clinical Internship VIII 1 s.h.**

Student rotation through different radiography-related areas of University of Iowa Health Care; assist, practice, and test radiographic examinations learned in didactic setting; skill building for care and management of patients; conduction of performance assessments and completion of guideline objectives for each rotation; performance expectations become progressively higher as students gain experience and skills. Prerequisites: RSRT:4125.

**RSRT:4230 Radiologic Technology Capstone and Certification Exam Preparation 2 s.h.**

Certification exam preparation; preparation and distribution of detailed written outlines of exam content; series of content-specific quizzes, midterm, and final "mock board" exam to evaluate student learning and preparedness for taking the American Registry of Radiologic Technologists (ARRT) national certification exams; professional preparation; for students in final semester of program. Requirements: enrollment in radiation sciences RT/BI, CT, CVI, or MRI program.