Radiologic Technology
Mississippi Curriculum Framework

Program CIP: 51.0911 – Radiologic Technology/Science – Radiographer

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The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), who serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

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Research Abstract

The curriculum framework outlined in this document reflects changes in the workplace and a number of other factors that impact local vocational–technical programs. Federal and state legislation require articulation between high school and community college programs, integration of academic and vocational skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment.

National skills standards, developed by industry groups and sponsored by the U.S. Department of Education and Labor, provide vocational educators with the expectations of employers across the United States. All of these factors are incorporated into the framework presented in this document.

The last validated and approved revision of this curriculum took place in 2018. In the fall of 2023, the Office of Curriculum and Instruction (OCI) conducted industry/program visits. An industry questionnaire was used to gather feedback concerning the trends and needs, both current and future, of the field. Industry members stated the curriculum was strong, but suggested that students, upon completion of the program, be encouraged to pursue certification in additional modalities. Currently, there are some areas where students are being hired as part-time employees while waiting for full-time positions to open in the radiologic technology field. The Office of Curriculum and Instruction also met with advisory committee members who echoed the feedback from industry representatives. Program faculty, administrators, and industry members were consulted regarding workforce needs and trends in the industry.

Adoption of National Certification Standards

The American Society of Radiologic Technologists Radiography Curriculum competencies and objectives were adopted for this curriculum. The American Registry of Radiologic Technologists (ARRT) is the world's largest credentialing organization that seeks to ensure high quality patient care in medical imaging, interventional procedures, and radiation therapy.

In support of this mission, the ARRT:

- Adopts and upholds standards for educational preparation for entry into the profession;
- Adopts and upholds standards of professional behavior consistent with the level of responsibility required by professional practice; and
- Develops and administers examinations which assess the knowledge and skills underlying the intelligent performance of the tasks typically required by professional practice in the discipline.

In addition to initial recognition, ARRT provides a mechanism to recognize individuals who continue to demonstrate their qualifications through adherence to the standards of professional behavior and compliance with continuing education requirements.

More information related to these Clinical and Didactic Standards can be found at the following website:
https://assets-us-01.kc-usercontent.com/406ac8c6-58e8-00b3-e3c1-0c312965deb2/68688f6b-d625-4fce-be07-b9b8a81b7d10/RAD_CC_2022.pdf

ARRT Test specifications
https://assets-us-01.kc-usercontent.com/406ac8c6-58e8-00b3-e3c1-0c312965deb2/c28cf141-f45c-44ef-acde-984929886e01/RAD_CS_2022.pdf

Industry standards are based on the American Registry of Radiologic Technologists (ARRT) Content Specifications for the Examination in Radiography.

Permission was granted by the American Society of Radiologic Technologists Organization to include the competencies and objectives in this curriculum. More information can be found at:
https://www.asrt.org/educators/asrt-curricula/radiography/radiography-curriculum

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Industry Job Projection Data

A summary of occupational data is available from the Mississippi Department of Employment Security.

https://mdes.ms.gov/information-center/labor-market-information/

Articulation

Check with the local community college CTE administration for articulation agreements.

Industry Credentials, Certifications, and Professional Licensure

As curricula are revised or developed for Career Technical Education (for credit) programs at Mississippi's community colleges, appropriate industry credentials/certifications/professional licensure are identified (where applicable).

Each community college cooperating with businesses/industries in their college district determines if and when industry credentials/certifications/professional licensure are warranted. Contact each community college for more information.

Dual Enrollment

See the "Procedures Manual for Dual Enrollment and Accelerated Programs"
http://www.mississippi.edu/cjc/dual_enrollment.asp

Program Description

Radiographers perform imaging examinations and accompanying responsibilities at the request of physicians and/or qualified practitioners qualified to prescribe and/or perform radiologic procedures. They utilize equipment emitting ionizing radiation or electromagnetic radiation to produce radiographic images of the internal structures of human anatomy. These radiographic images are utilized by the physician for diagnostic purposes. The radiographer is responsible for all functions in the Radiology Department to ensure consistent radiographic images and provide for personal and patient safety from ionizing radiation. In addition to producing diagnostic images and primary patient care, other responsibilities may include administrative and educational functions, such as completing the requirements for an Associate of Applied Science Degree in Radiologic Technology.

Graduates of this 2-year program will be awarded an Associate of Applied Science Degree in Radiologic Technology and are eligible to make application to the American Registry of Radiologic Technology in order to become a Registered Technologist Radiographer.

Industry and curriculum standards can be found in the Adoption of National Certification Standards page.

Suggested Course Sequence

Associate of Applied Science Required Courses

			SCH Breakdown				Contact Hour Breakdown			Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Contact Hours	Lecture	Lab	Clinical/ Internship	Certification Name
RGT 111(3-5)	Clinical Education I	3-5	0	0	9-15	135-225	0	0	135-225	
RGT 112(3-5)	Clinical Education II	3-5	0	0	9-15	135-225	0	0	135-225	
RGT 113(5-9)	Clinical Education III	5-9	0	0	15-27	225-405	0	0	180-405	
RGT 121(2-3)	Fundamentals of Radiography	2-3	2-3	0	0	30-45	30-45	0	0	
RGT 122(2-3)	Patient Care and Radiography	2-3	2	0-2	0	30-60	30	30	0	
RGT 1312	Radiation Protection	2	2	0	0	30	30	0	0	
RGT 1323	Image Production	3	2	2	0	60	30	30	0	
RGT 1333	Digital Image Analysis	3	2	2	0	60	30	30	0	
RGT 151(3-4)	Radiographic Procedures I	3-4	2	2-4	0	60-90	30	30-60	0	
RGT 1523	Radiographic Procedures II	3	2	2	0	60	30	30	0	
RGT 1613	Physics of Imaging Equipment	3	3	0	0	45	45	0	0	
RGT 2132	Ethical and Legal Responsibilities	2	2	0	0	30	30	0	0	
RGT 214(6-7)	Clinical Education IV	6-7	0	0	18-21	270-315	0	0	270-315	
RGT 215(6-7)	Clinical Education V	6-7	0	0	18-21	270-315	0	0	270-315	
RGT 2532	Radiographic Procedures III	2	1	2	0	45	15	30	0	
RGT 2542	Radiographic Procedures IV	2	2	0	0	30	30	0	0	
RGT 2911	Radiation Biology	1	1	0	0	15	15	0	0	
RGT 2922	Radiographic Pathology	2	2	0	0	30	30	0	0	
RGT 293(2-3)	Certification Fundamentals	2-3	2-3	0-2	0	30-45	30-45	0-30	0	
	*elective approved list	0-8								
	Total	**60-74**	**29**	**12**	**93**	***2010**	***435**	***180**	***1395**	

American Registry of Radiologic Technologist (ARRT) Examination

***These totals are based on 66 program credit hours.**

General Education Core Courses

To receive the Associate of Applied Science degree, a student must complete all of the required coursework found in the Career Certificate option, Technical certificate option, and a minimum of 15 semester hours of General Education core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science degree at their college. The Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) Section 9 Standard 3 of the *Principles of Accreditation: Foundations for Quality Enhancement*[1] describes the general education core.

Section 9 Standard 3:

3. The institution requires the successful completion of a general education component at the undergraduate level that

   a) is based on a coherent rationale.

   b) is a substantial component of each undergraduate degree program. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours of the equivalent; for baccalaureate programs, a minimum of 30 semester hours or the equivalent.

   c) ensures breadth of knowledge. These credit hours include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. These courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession.

General Education Courses

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
	Humanities/Fine Arts	3						
	Social/Behavioral Sciences	3						
MAT 1313	College Algebra*	3-4						
BIO 1514 or BIO 2514	Anatomy and Physiology I with lab	4						
BIO 1524 or BIO 2524	Anatomy and Physiology II with lab	4						
	Academic electives	6						
	TOTAL	**23-24**						

***Or higher Math as approved by individual administration**

[1] Southern Association of Colleges and Schools Commission on Colleges. (2023). *The Principles of Accreditation: Foundations for Quality Enhancement*. Retrieved from https://sacscoc.org/app/uploads/2024/01/2024PrinciplesOfAccreditation.pdf

Approved Program CTE and Academic Electives

			SCH Breakdown				Credit Hour Breakdown			Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical	Total Contact Hours	Lecture	Lab	Clinical	Certification Name
RGT 1111	Radiologic Seminar I	1	1	0	0	15	15	0	0	
RGT 1121	Radiologic Seminar II	1	1	0	0	15	15	0	0	
RGT 2111	Radiologic Seminar III	1	1	0	0	15	15	0	0	
RGT 211(3-4)	Mammography	3-4	3-4	0	0	45-60	45-60	0	0	
RGT 2121	Radiologic Seminar IV	1-2	1-2	0	0	15-30	15-30	0	0	
RGT 2123	Sectional Anatomy	3-4	3-4	0	0	45-60	45-60	0	0	
RGT 214(3-4)	Magnetic Resonance Imaging	3-4	3-4	0	0	45-60	0	0	0	
RGT 221(5-7)	Mammography Clinical I	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 222(5-7)	Mammography Clinical II	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 2233	CT Cardiac	3	3	0	0	45	45	0	0	
RGT 2243	Physiology and Pathology Correlation in Computed Tomography	3	3	0	0	45	45	0	0	
RGT 2253	CT Physics – Instrumentation and Imaging	3	3	0	0	45	45	0	0	
RGT 2263	Planar and Volumetric Postprocessing	3	3	0	0	45	45	0	0	
RGT 2273	Artificial Intelligence for Imaging	3	3	0	0	45	45	0	0	
RGT 228(5-7)	CT Clinical I	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 229(5-7)	CT Clinical II	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 2233	Computed Tomography	3	3	0	0	45	45	0	0	
RGT 231(3-4)	Cardiac Interventional Structural Basics	3-4	3-4	0	0	45	45	0	0	
RGT 232(3-4)	Vascular Interventional Structural Basics	3-4	3-4	0	0	45-60	46-60	0	0	
RGT 233(5-7)	MRI Clinical I	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 234(5-7)	MRI Clinical II	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 235(5-7)	Cardiac Interventional Clinical I	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 236(5-7)	Cardiac Interventional Clinical II	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 237(5-7)	Vascular Interventional Clinical I	5-7	0	0	15-21	225-315	0	0	15-21	
RGT 238(5-7)	Vascular Interventional Clinical II	5-7	0	0	15-21	225-315	0	0	15-21	
	Medical Terminology (TAH 1113, BIO 1813, HIT 1213 or other electives that meet accrediting body standards)	3								
	Other Instructor Approved Elective(s) per local community college									

Work Ready and Career Certificate Options

- Basic Computed Tomography/15 Hour Work Ready Certificate
- Magnetic Resonance/15 Hour Work Ready Certificate
- Cardiac Interventional/15 Hour Work Ready Certificate
- Vascular Interventional/15 Hour Work Ready Certificate
- Mammography/15 Hour Work Ready Certificate
- Advanced Computed Tomography/30 Hour Career Certificate

***These courses are designed for students who have completed their AAS degree or higher.**
****Entrance requirements for these programs will be set by the local community college.**

Work Ready and Career Certificate Suggested Course Sequence

*Basic Computed Tomography/15 Hour Work Ready Certificate

			SCH Breakdown				Contact Hour Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Contact Hours	Lecture	Lab	Clinical/ Internship	Certification Name
RGT 2123	Sectional Anatomy	3	3			45				
RGT 2133	Computed Tomography	3	3			45				
RGT 2165	CT Clinical I	5	0		15	225				
RGT 2174	CT Clinical II	4	0		12	180				

*Magnetic Resonance/15 Hour Work Ready Certificate

			SCH Breakdown				Contact Hour Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Contact Hours	Lecture	Lab	Clinical/ Internship	Certification Name
RGT 2123	Sectional Anatomy	3	3			45				
RGT 2144	Magnetic Resonance Imaging	4	4			60				
RGT 2335	MRI Clinical I	5	0		15	225				
RGT 2344	MRI Clinical II	4	0		12	180				

*Cardiac Interventional/15 Hour Work Ready Certificate

			SCH Breakdown				Contact Hour Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Contact Hours	Lecture	Lab	Clinical/ Internship	Certification Name
RGT 2314	Cardiac Interventional Structural Basics	4	4			60				
RGT 2356	Cardiac Interventional Clinical I	6	0		18	270				
RGT 2365	Cardiac Interventional Clinical II	5	0		15	225				

*Vascular Interventional/15 Hour Work Ready Certificate

			SCH Breakdown				Contact Hour Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Contact Hours	Lecture	Lab	Clinical/ Internship	Certification Name
RGT 2324	Vascular Interventional Structural Basics	4	4			60				
RGT 2376	Vascular Interventional Clinical I	6	0		18	270				
RGT 2385	Vascular Interventional Clinical II	5	0		15	225				

*Mammography/15 Hour Work Ready Certificate

			SCH Breakdown				Contact Hour Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Contact Hours	Lecture	Lab	Clinical/ Internship	Certification Name
RGT 211(3-4)	Mammography	3-4	3-4							
RGT 221(5-7)	Mammography Clinical I	5-7	0		15-21	225-315				
RGT 222(5-7)	Mammography Clinical II	5-7	0		15-21	225-315				

*Advanced Computed Tomography/30 Hour Career Certificate

			SCH Breakdown				Contact Hour Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total Contact Hours	Lecture	Lab	Clinical/ Internship	Certification Name
RGT 2123	Sectional Anatomy	3	3			45				
RGT 2133	Computed Tomography	3	3			45				
RGT 2153	CT Cardiac	3	3			45				
RGT 2163	Physiology and Pathology Correlation in Computed Tomography	3	3			45				
RGT 2173	CT Physics – Instrumentation and Imaging	3	3			45				
RGT 2183	Planar and Volumetric Postprocessing	3	3			45				
RGT 2193	Artificial Intelligence for Imaging	3	3			45				
RGT 2285	CT Clinical I	5	0		15	225				
RGT 2294	CT Clinical II	4	0		12	180				

Course Descriptions

Course Number and Course Name: **RGT 111(3-5) Clinical Education I**

Description: This course includes clinical practice and instruction in a clinical affiliate. Areas included are patient care and management, radiation protection, operation of equipment, and radiologic procedures.

Hour Breakdown:

Semester Credit Hours	Lecture	Clinical	Contact Hours
3	0	9	135
4	0	12	180
5	0	15	225

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply radiographic principles in the clinical setting with respect to program levels
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition, and carry out appropriate actions.
   b. Manage interaction with the patient and family in a manner that provides the desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Explain the elements of procedural performance and radiation protection.
   e. Apply radiation protection principles.
   f. Discuss basic X-ray production and interactions.
   g. Operate medical imaging equipment and accessory devices.
   h. Position the patient and medical imaging system to perform examinations and procedures.
   i. Apply knowledge of human structure, function, and pathology.
   j. Evaluate the performance of medical imaging systems.
   k. Evaluate medical images for technical quality.
   l. Apply knowledge and skills relating to recording medical image processing.
   m. Operate equipment within safety limits.
   n. Recognize equipment malfunctions, and report them to the proper authority.
   o. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   p. Demonstrate safe, ethical, and legal practices.
   q. List the radiography practice standards.
   r. Abide by the profession's code of ethics, and comply with the recognized scope of practice for the profession.
   s. Practice standard precautions at all times.
2. Perform clinical application skills for radiographic procedures.
   a. Practice routine radiographic procedures including the following:
      (1) Chest
      (2) Abdomen
      (3) Upper extremities to include shoulder girdle
      (4) Digestive system
   b. Perform image analysis of the following procedures:
      (1) Chest
      (2) Abdomen
      (3) Upper extremities to include shoulder girdle
      (4) Digestive system
   c. Recognize the requirements for clinical competency.

3. Demonstrate tasks associated with radiographic procedures.
    a. Abide by physician's orders and radiography requests.
    b. Identify proper scheduling and sequencing of exams.
    c. Evaluate order/requisition and corrective measures as necessary.
    d. Verify patient identification.
    e. Facilities set up.
    f. Manipulate radiographic equipment.
    g. Demonstrate patient transport techniques.
    h. Identify accessory equipment.
    i. Process radiographs.
    j. Follow line structure organization within departments and institutions.
    k. Apply basic radiation protection.
    l. Demonstrate effective communication skills.
    m. Patient assessment, clinical history, education and care.
        (1) Patient monitoring – emergency and non-emergency
        (2) Vital signs
        (3) Assessment and clinical history
        (4) Equipment
        (5) Patient emergencies
4. Acknowledge the Standards of Ethics and professional behavior.
    a. Abide by ARRT standards of Ethics and Professional behavior.
    b. Abide by student supervision policies (Direct and Indirect).
    c. Acknowledge the patient's expectations, rights, and responsibilities.
    d. Abide by radiographer's professional responsibilities.
5. Demonstrate Professional Communication.
    a. Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
    b. Demonstrate professional communication with all health care professionals.
    c. Demonstrate proper confidentiality of patient's records (HIPAA compliance).
6. Acknowledge Radiography Practice Standards.
    a. Abide by the Scope of practice, clinical, quality, and professional performance standards.
    b. Acknowledge ASRT's Advisory and Best Practices in Digital Radiography.
7. Acknowledge Personal, Society, and Professional Values.
    a. Recognize how values are developed.
    b. Recognize the effect of personal, society, professional values on the patient care.
    c. Recognize the effect of social media on professional values.
    d. Recognize how value conflicts can be resolved.
8. Acknowledge Diversity, equity, and inclusion.
    a. Examine the diversity concepts between personal, community, and societal values.
    b. Discuss socioeconomic factors.
    c. Identify culture, race, and ethnicity.
    d. Recognize gender identity/expression.
    e. Recognize differences in age groups.
        (1) Infant
        (2) Child
        (3) Adolescent
        (4) Adult
        (5) Middle-age
        (6) Geriatric
    f. Recognize different family structures and dynamics.
    g. Recognize differences in diversity based on geographical factors.
    h. Examine relationships of individuals with regards to differences in religion, spirituality, belief system, lifestyle choices and behaviors, sexual orientation and disability.
    i. Recognize equity in relation to structural racism and social justice.

j. Recognize the culture of inclusion in relation to the environment and organizations.

9. Practice Procedural Performance.
    a. Acknowledge Scheduling and Sequencing of exams.
    b. Evaluate Order/Requisition and Corrective measures.
    c. Identify Facility Set-ups.
    d. Demonstrate Patient Assessment, clinical history, education, and care.
        (1) Demonstrate Patient Monitoring (Emergency and Non-Emergency).
            a) Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
            b) Demonstrate professional communication with all health care professionals.
            c) Demonstrate proper confidentiality of patient's records (HIPAA compliance).
        (2) Demonstrate Patient Privacy and Confidentiality (HIPAA).
        (3) Practice Proper Documentation.
        (4) Demonstrate Infection Control.
            a) Personal Protective Equipment (PPE).
                i. Types
                ii. Proper Use
        (5) Demonstrate Patient Education.
            a) Appropriate Communication
            b) Age-Specific
            c) Cultural Sensitivity
            d) Socioeconomic Sensitivity
            e) Patient-Centered Care
        (6) Recognize ways to reduce medical error.
        (7) Recognize Patient Safety Considerations.
    e. Practice Imaging Considerations.
        (1) Identify Positioning Considerations.
        (2) Identify Technical Considerations.
        (3) Practice Image Acquisition.
        (4) Practice Image Analysis.
    f. Practice Radiation Protection.
        (1) Practice Protection Principles (ALARA).
        (2) Practice Radiation Safety.
        (3) Protection of the patient (AAPM recommendations).
        (4) Protection of personnel.
        (5) Protection of others.
        (6) Practice Protection Education for the following:
        (7) Patient, family members, or authorized representatives.
        (8) Other members of the healthcare team.
    g. Recognize Proper Protection Equipment and Accessories.
10. Recognize Clinical Competencies.

ASRT - Clinical Practice

1. Discuss ethics and the characteristics of professional behavior.
2. Apply professional communication techniques.
3. List the radiography practice standards.
4. Demonstrate positive values and a commitment to diversity, equity, and inclusion.
5. Explain the elements of procedural performance and radiation protection.
6. Recognize the requirements for clinical competency.

Course Number and Course Name: **RGT 112(3-5) Clinical Education II**

Description: This course involves clinical practice and instruction in a clinical affiliate. Areas included are patient care and management, radiation protection, operation of equipment, and radiologic procedures. This is a continuation from Clinical Education I.

Hour Breakdown:

Semester Credit Hours	Lecture	Clinical	Contact Hours
3	0	9	135
4	0	12	180
5	0	15	225

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply radiographic principles in the clinical setting with respect to program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition, and carry out appropriate actions.
   b. Manage interaction with the patient and family in a manner that provides the desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic X-ray production and interactions.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions, and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics, and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application skills for radiographic procedures.
   a. Practice routine radiographic procedures including the following:
      (1) Spinal column
      (2) Pelvic girdle
      (3) Lower extremities
      (4) Urinary systems
      (5) Bony thorax
   b. Perform image analysis on the following procedures:
      (1) Spinal column
      (2) Pelvic girdle
      (3) Lower extremities
      (4) Urinary systems
      (5) Bony thorax
   c. Demonstrate tasks associated with radiographic procedures.
   d. Perform routine radiographic procedures including the following:
      (1) Chest
      (2) Abdomen

(3) Digestive system
(4) Upper extremities and shoulder girdle
(5) Evaluate image analysis

3. Discuss medical and professional culture and diversity.
   a. Examine the interrelationship between personal, community, and societal values.
   b. Explain the influence a person's value system has on his or her behavior.
   c. Examine how professional values are imparted.
   d. Assess the effect of a conflict between a patient's values and a health professional's values on the resultant care that a patient may receive.
   e. Discuss morality and its development.
   f. Contrast culture and ethnicity, and provide examples of each.
   g. Explain how a person's cultural bias toward illness affects his or her recovery.
   h. Explain the roots of medical ethnocentrism.
   i. Discuss the societal factors that influence the quality of health care a patient may receive.
   j. Describe the culture of poverty and the effect and delivery on the health-care system.
   k. Discuss the patient advocacy role of the health professional in relation to effective patient communication.
   l. Discuss the importance of understanding verbal and nonverbal communications in various cultures.
   m. Contrast differences in age groups.
      (1) Infant
      (2) Child
      (3) Adolescent
      (4) Adult
      (5) Middle-age
      (6) Geriatric
   n. Examine relationships of individuals with regards to differences in religion, spirituality, belief system, lifestyle choices and behaviors, sexual orientation and disability.
4. Acknowledge the Standards of Ethics and professional behavior.
   a. Abide by ARRT standards of Ethics and Professional behavior.
   b. Abide by student supervision policies (Direct and Indirect).
   c. Acknowledge the patient's expectations, rights, and responsibilities.
   d. Abide by radiographer's professional responsibilities.
5. Demonstrate Professional Communication.
   a. Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
   b. Demonstrate professional communication with all health care professionals.
   c. Demonstrate proper confidentiality of patient's records (HIPAA compliance).
6. Acknowledge Radiography Practice Standards.
   a. Abide by the Scope of practice, clinical, quality, and professional performance standards.
   b. Acknowledge ASRT's Advisory and Best Practices in Digital Radiography.
7. Acknowledge Personal, Society, and Professional Values.
   a. Recognize how values are developed.
   b. Recognize the effect of personal, society, professional values on the patient care.
   c. Recognize the effect of social media on professional values.
   d. Recognize how value conflicts can be resolved.
8. Acknowledge Diversity, equity, and inclusion.
   a. Examine the diversity concepts between personal, community, and societal values.
   b. Discuss socioeconomic factors.
   c. Identify culture, race, and ethnicity.
   d. Recognize gender identity/expression.
   e. Recognize differences in age groups.
      (1) Infant
      (2) Child
      (3) Adolescent
      (4) Adult

(5) Middle-age
(6) Geriatric

f. Recognize different family structures and dynamics.
g. Recognize differences in diversity based on geographical factors.
h. Examine relationships of individuals with regards to differences in religion, spirituality, belief system, lifestyle choices and behaviors, sexual orientation and disability.
i. Recognize equity in relation to structural racism and social justice.
j. Recognize the culture of inclusion in relation to the environment and organizations.

9. Practice Procedural Performance.
   a. Acknowledge Scheduling and Sequencing of exams.
   b. Evaluate Order/Requisition and Corrective measures.
   c. Identify Facility Set-ups.
   d. Demonstrate Patient Assessment, clinical history, education, and care.
      (1) Demonstrate Patient Monitoring (Emergency and Non-Emergency).
         a) Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
         b) Demonstrate professional communication with all health care professionals.
         c) Demonstrate proper confidentiality of patient's records (HIPAA compliance).
      (2) Demonstrate Patient Privacy and Confidentiality (HIPAA).
      (3) Practice Proper Documentation.
      (4) Demonstrate Infection Control.
         a) Personal Protective Equipment (PPE)
            i. Types
            ii. Proper Use
      (5) Demonstrate Patient Education.
         a) Appropriate Communication
         b) Age-Specific
         c) Cultural Sensitivity
         d) Socioeconomic Sensitivity
         e) Patient-Centered Care
      (6) Recognize ways to reduce medical error.
      (7) Recognize Patient Safety Considerations.
   e. Practice Imaging Considerations.
      (1) Identify Positioning Considerations.
      (2) Identify Technical Considerations.
      (3) Practice Image Acquisition.
      (4) Practice Image Analysis.
   f. Practice Radiation Protection.
      (1) Practice Protection Principles (ALARA).
      (2) Practice Radiation Safety.
         a) Protection of the patient (AAPM recommendations).
         b) Protection of personnel.
         c) Protection of others.
      (3) Practice Protection Education for the following:
         a) Patient, family members, or authorized representatives.
         b) Other members of the healthcare team.
   g. Recognize Proper Protection Equipment and Accessories.
10. Recognize Clinical Competencies.

ASRT - Clinical Practice

1. Discuss ethics and the characteristics of professional behavior.
2. Apply professional communication techniques.
3. List the radiography practice standards.
4. Demonstrate positive values and a commitment to diversity, equity, and inclusion.
5. Explain the elements of procedural performance and radiation protection.
6. Recognize the requirements for clinical competency.

Course Number and Course Name: **RGT 113(5-9)** **Clinical Education III**

Description: This course is a clinical practice and instruction in a clinical affiliate. Areas included are patient care and management, radiation protection, operation of equipment, and radiologic procedures. This is a continuation from Clinical Education I and II.

Hour Breakdown:

Semester Credit Hours	Lecture	Clinical	Contact Hours
5	0	15	225
6	0	18	270
7	0	21	315
8	0	24	360
9	0	27	405

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply radiographic principles in the clinical setting with respect to program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition, and carry out appropriate actions.
   b. Manage interaction with the patient and family in a manner that provides the desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic X-ray production and interactions.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions, and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics, and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
   r. Adhere to concepts of team practice that focus on organizational theories, roles of team members, and conflict resolution.
   s. Evaluate procedure orders for accuracy, and follow up to make corrective changes.
   t. Exercise independent judgment and discretion in the technical performance of medical imaging procedures.
2. Perform clinical application skills for radiographic procedures.
   a. Practice routine radiographic procedures including the following:
      (1) Mobile (portable) radiography
      (2) Trauma
   b. Perform image analysis of the following:
      (1) Mobile (portable) radiography
      (2) Trauma Outline documentation procedures when abuse is suspected
3. Demonstrate tasks associated with radiographic procedures.
   a. Perform routine radiographic procedures including the following:
      (1) Spine
      (2) Pelvic girdle
      (3) Lower extremities

(4) Urinary systems
(5) Bony thorax

b. Perform advanced radiographic procedures including the following:
(1) Chest
(2) Abdomen
(3) Digestive system
(4) Upper extremities including shoulder girdle
(5) Bony thorax
(6) Evaluate image analysis

4. Acknowledge the Standards of Ethics and professional behavior.
a. Abide by ARRT standards of Ethics and Professional behavior.
b. Abide by student supervision policies (Direct and Indirect).
c. Acknowledge the patient's expectations, rights, and responsibilities.
d. Abide by radiographer's professional responsibilities.

5. Demonstrate Professional Communication.
a. Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
b. Demonstrate professional communication with all health care professionals.
c. Demonstrate proper confidentiality of patient's records (HIPAA compliance).

6. Acknowledge Radiography Practice Standards.
a. Abide by the Scope of practice, clinical, quality, and professional performance standards.
b. Acknowledge ASRT's Advisory and Best Practices in Digital Radiography.

7. Acknowledge Personal, Society, and Professional Values.
a. Recognize how values are developed.
b. Recognize the effect of personal, society, professional values on the patient care.
c. Recognize the effect of social media on professional values.
d. Recognize how value conflicts can be resolved.

8. Acknowledge Diversity, equity, and inclusion.
a. Examine the diversity concepts between personal, community, and societal values.
b. Discuss socioeconomic factors.
c. Identify culture, race, and ethnicity.
d. Recognize gender identity/expression.
e. Recognize differences in age groups.
(1) Infant
(2) Child
(3) Adolescent
(4) Adult
(5) Middle-age
(6) Geriatric
f. Recognize different family structures and dynamics.
g. Recognize differences in diversity based on geographical factors.
h. Examine relationships of individuals with regards to differences in religion, spirituality, belief system, lifestyle choices and behaviors, sexual orientation and disability.
i. Recognize equity in relation to structural racism and social justice.
j. Recognize the culture of inclusion in relation to the environment and organizations.

9. Practice Procedural Performance.
a. Acknowledge Scheduling and Sequencing of exams.
b. Evaluate Order/Requisition and Corrective measures.
c. Identify Facility Set-ups.
d. Demonstrate Patient Assessment, clinical history, education, and care.
(1) Demonstrate Patient Monitoring (Emergency and Non-Emergency).
a) Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
b) Demonstrate professional communication with all health care professionals.

c) Demonstrate proper confidentiality of patient's records (HIPAA compliance).
(2) Demonstrate Patient Privacy and Confidentiality (HIPAA).
(3) Practice Proper Documentation.
(4) Demonstrate Infection Control.
a) Personal Protective Equipment (PPE).
i. Types
ii. Proper Use
(5) Demonstrate Patient Education.
a) Appropriate Communication
b) Age-Specific
c) Cultural Sensitivity
d) Socioeconomic Sensitivity
e) Patient-Centered Care
(6) Recognize ways to reduce medical error.
(7) Recognize Patient Safety Considerations.

e. Practice Imaging Considerations.
(1) Identify Positioning Considerations.
(2) Identify Technical Considerations.
(3) Practice Image Acquisition.
(4) Practice Image Analysis.

f. Practice Radiation Protection.
(1) Practice Protection Principles (ALARA).
(2) Practice Radiation Safety.
a) Protection of the patient (AAPM recommendations).
b) Protection of personnel.
c) Protection of others.
(3) Practice Protection Education for the following:
a) Patient, family members, or authorized representatives
b) Other members of the healthcare team

g. Recognize Proper Protection Equipment and Accessories.

10. Recognize Clinical Competencies.

ASRT - Clinical Practice

1. Discuss ethics and the characteristics of professional behavior.
2. Apply professional communication techniques.
3. List the radiography practice standards.
4. Demonstrate positive values and a commitment to diversity, equity, and inclusion.
5. Explain the elements of procedural performance and radiation protection.
6. Recognize the requirements for clinical competency.

Course Number and Course Name: **RGT 121(2-3) Fundamentals of Radiography**

Description: This course is an introduction to Radiologic Technology including professional, departmental, and historical aspects. Included are overviews of terminology, health professions, and regulatory agencies.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
2	2	0	30
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe the role, organization, and structure of the program, radiology department, hospital, and professions.
    a. Identify other health science professions that participate in the patient's total health care.
    b. Describe the relationship of these health-care workers to the integrated care of patients.
    c. Identify the various sites and settings in which health care is delivered.
    d. Define the reimbursement and payment options for health-care services and the importance of CPT coding.
    e. Discuss the general employment outlook for the graduate radiographer.
    f. Discuss career advancement and opportunities for the radiographer.
    g. Identify the benefits of continuing education as related to improved patient care and professional enhancement.
    h. Discuss the philosophy and mission of the affiliated hospital and clinical education center(s).
    i. Identify selected administrative personnel, and discuss their relationship with the radiology department.
    j. Describe relationships and interprofessional collaboration of departments within the hospitals and clinical education center(s).
    k. Identify and discuss the responsibilities and relationships of all personnel in the radiology department.
    l. Explain patient services available in the radiology department.
    m. Define accreditation, credentialing, certification, licensure, and regulations.
    n. Describe how the JRCERT Standards for an accredited educational program in Radiologic Sciences relate to the educational program.
    o. Explain the difference between the accreditation and credentialing processes, and identify agencies involved in each process.
    p. Differentiate between programmatic and institutional accreditation.
    q. Identify the responsibilities of the health-care facility and members of the health-care team.
    r. List the general responsibilities of the radiographer.
    s. Describe the Scope of Practice for the radiographer as defined by the American Society of Radiologic Technologists (ASRT) and state licensure.
    t. Explain the use of various communication devices and systems.
    u. Explain the purpose, legal considerations, and procedures for reporting an accident or incident.
    v. Identify common medical procedures.
2. Translate medical terms, abbreviations, and symbols into common language.
    a. Define, spell, and pronounce medical terms.
    b. Recognize and utilize the word building process.
    c. Interpret medical abbreviations and symbols and restrictions.
    d. Recognize and interpret orders, requests, and diagnostic reports.
    e. Comprehend radiation science terms.

ASRT - Introduction to Radiologic Science and Health Care

1. Recognize and discuss medical procedures and terminology.
2. Analyze medical reports, orders, and requests.
3. List medical imaging, radiologic sciences, and other health professions.
4. Evaluate evidence-based health care practices.
5. Describe health care environments, organizations, and regulatory agencies.
6. Discuss radiology organization and staffing.
7. Explain professional credentialing and the associated organizations.
8. Demonstrate professional development and advancement.

Course Number and Course Name: **RGT 122(2-3) Patient Care and Radiography**

Description: Content provides the concepts of optimal patient care, including consideration for the physical and psychological needs of the patient and family. Routine and emergency patient care procedures are described, as well as infection control procedures using standard precautions. The role of the radiographer in patient education is identified.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
2	2	0	30
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Employ interpersonal skills to alleviate patients' fears, and promote a professional environment.
   a. Discuss the responsibilities of the health-care facility.
   b. Discuss the responsibilities of the radiographer.
   c. Discuss the Scope of Practice for the radiographer.
   d. Discuss the perceptions of death and dying from patient and technologist viewpoints.
   e. Discuss ethical, emotional, personal, and physical aspects of death.
   f. List the stages of dying, and describe the characteristics of each stage.
   g. Identify the support mechanisms available to the terminally ill.
   h. Describe methods of determining the proper patient identification.
   i. Explain the use of the following:
      (1) Positioning
      (2) Length of Procedure
      (3) Immobilization
   j. Alleviate fears by explaining the following:
      (1) Positioning for examination
      (2) Length of procedure
      (3) Room noises
      (4) Machine movement
      (5) Machine and patient contact
   k. Interact with patients' family members and friends using case studies.
   l. Identify select perceptions of death and dying from patient and technologist viewpoints.
   m. Identify ethical, emotional, personal, and physical aspects of death.
   n. Define communication.
   o. Identify methods of communication, and discuss how each can be utilized in patient education.
   p. Identify patient communication problems, and discuss how each can be overcome to provide patient education.
   q. Demonstrate explanations of radiographic examinations when given clinical simulations (e.g., chest, UGI, and extremity).
   r. Demonstrate explanations for patients with various communication problems (e.g., hearing, vision, and speech problems; impaired mental function; altered states of consciousness; and patients who do not speak English) using clinical simulations.
   s. Explain the role of the technologist in patient education.

2. Employ general safety and transfer precautions.
   a. Describe environmental safety precautions.
   b. Demonstrate correct principles of body mechanics applicable to patient care.
   c. Demonstrate techniques for specific types of patient transfer.
   d. Demonstrate select procedures for turning patients with various health conditions.
   e. Describe select immobilization techniques for various types of procedures and patient conditions.
   f. Describe specific patient safety measures and concerns.
   g. Discuss procedures for assuring security of property of inpatients and outpatients.
   h. Demonstrate correct patient positions (supine, prone, and others as listed in ASRT).
   i. Discuss MR Safety.
   j. Discuss incident reporting.
3. Evaluate physical needs.
   a. Describe methods for evaluation of patient status.
   b. Identify the information to be collected prior to patient examination.
   c. Describe vital signs used to assess patient condition.
   d. Convert a Fahrenheit measurement to the Celsius equivalent.
   e. State the normal temperature values for the oral and rectal methods of measurement for temperature.
   f. Describe the method of monitoring respirations, and state the normal values expected.
   g. List the equipment necessary for acquisition of the blood pressure on a patient.
   h. Identify the normal values for blood pressure for males and females.
   i. Compare adult vs. pediatric vital signs.
   j. Identify the seven major sites for monitoring the pulse, and indicate the normal values.
   k. Demonstrate the assessment of vital signs.
   l. List the normal ranges for specific laboratory studies.
   m. Evaluate the elements of a patient record.
   n. Discuss patient pain assessment.
4. Describe infection control precautions.
   a. Define terms related to infection control.
   b. Describe the importance of standard precautions and isolation procedures.
   c. Explain sources and modes of transmission of infections and diseases.
   d. List institutional and departmental procedures for infection control.
   e. Describe methods for the prevention of infection to the health worker and patient.
5. Recognize and employ appropriate responses to acute situations and medical emergencies.
   a. Identify symptoms related to specific emergency situations.
   b. Describe the emergency medical code system for the institution and the role of the student during a medical emergency.
   c. Demonstrate the use of specific medical emergency equipment and supplies.
   d. Given simulations, demonstrate the following:
      (1) use of oxygen, suction and pulse oximetry equipment
      (2) select first aid techniques
   e. List the special considerations necessary when performing radiographic procedures on the following:
      (1) infant or a child
      (2) geriatric patient
   f. List the symptoms and precautions taken for a patient with the following:
      (1) head injury
      (2) spinal injury
      (3) massive wounds
   g. List the types, immobilization devices, and positioning for upper and lower extremity fractures.
   h. List the classifications and medical interventions for burns.
   i. Describe the symptoms and medical interventions for a patient having a reaction to contrast agents.
6. Respond to patient needs in special situations.
   a. Explain the role of the technologist in patient education.
   b. Describe the different types of patient preparation for barium studies.
   c. Describe the procedure to properly prepare a patient for a barium study.

d. Describe the purpose for using contrast agents.
e. Explain the indication and procedure when given specific tube management situations (nasogastric, suction, tracheostomy, chest tube, tissue drains, oxygen administration, urinary collection, and other ostomies).
f. Identify the precautions involved when given specific tube management situations (nasogastric, suction, tracheostomy, chest tube, tissue drains, oxygen administration, urinary collection, and other ostomies).
g. Identify the steps in the operation and maintenance of suction equipment.
h. Identify the monitoring, pre- and postprocedure care, drug administration, and special precautions for a patient undergoing myelography and urography.
i. Demonstrate the appropriate procedure for gathering information prior to performing a bedside radiographic examination.
j. Describe the special precautions to be used when performing a procedure on a neonate.
k. Explain the procedure for placing an image receptor under a patient in an orthopedic bed frame.
l. Describe the special problems faced in performing procedures on patients with tracheotomy and specific tubes, drains, and catheters.
m. Describe the procedure for producing diagnostic images in the surgical suite and endoscopy.
n. Identify types of contrast agents:
    (1) Metallic salt
    (2) Organic iodides
    (3) Gases

ASRT - Patient Care and Services in the Medical Imaging and Radiologic Sciences

1. Recognize the members of the health care team and their responsibilities.
2. Describe the elements of professionalism in health care, including attitudes, communication techniques, and psychological aspects of patient care.
3. Apply environmental, occupational, and patient safety techniques.
4. Evaluate patient health using vital signs, laboratory tests, pain assessments, and patient records.
5. Discuss the types, characteristics, and spread of infectious pathogens.
6. Demonstrate infection control practices, procedures, and equipment.
7. Identify and respond to medical emergencies.
8. Recognize and accommodate traumatic injuries.
9. Explain drug classifications, naming, routes of administration, and safety practices.
10. List drug categories relevant to radiography.
11. Describe types of contrast agents and their application.
12. Demonstrate safe venipuncture technique and management of tubes, catheters, lines, and other interventional medical devices.

Regulations of R.T. practice vary by state and institution. However, the official position of the American Society of Radiologic Technologists is that the content of the ASRT Practice Standards should be included in educational programs, regardless of the limitations of the state or institution where the curriculum is taught. In states or institutions where students are permitted to perform intravenous injections, the educational program has ethical and legal responsibilities to the patient and the student. The student shall be assured that:

- Legal statutes allow student radiographers to perform venipuncture.
- Professional liability coverage is adequate.
- Adequate supervision is provided.
- Appropriate, structured laboratory objectives are identified.
- Evaluation of competency occurs before venipuncture is performed unsupervised.

Course Number and Course Name: **RGT 1312 Radiation Protection**

Description: This course is designed to present an overview of the principles of radiation protection including the responsibilities of the radiographer for patients, personnel, and the public. Radiation health and safety requirements of federal and state regulatory agencies, accreditation agencies, and health-care organizations are incorporated.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
2	2	0	30

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Recognize the various health effects of radiation exposure.
   a. Identify and justify the need to minimize unproductive radiation exposure of humans.
   b. Distinguish between somatic and genetic radiation effects (immediate and latent), and provide examples of each.
   c. Differentiate between the stochastic and non-stochastic effects of radiation exposure, and provide examples of each.
   d. List the objectives of a radiation protection program, and demonstrate the ability to document the same.
   e. Identify effective dose equivalent limits for occupational and non-occupational radiation exposure.
   f. Identify the acronym ALARA, and describe the concept (optimization).
   g. Identify the basis for occupational exposure limits: comparable risk.
   h. Describe the concept of negligible individual risk level (NIRL).
   i. Identify ionizing radiations from natural and man-made sources, and list their approximate dose equivalent contribution.
   j. Identify legal and ethical radiation protection responsibilities of radiation workers.
2. List the units and measures used to evaluate radiation exposure.
   a. Identify and define units of radiation for exposure, absorbed dose, dose equivalent, and radioactivity.
   b. Define and describe the interrelationship between relative biological effectiveness and quality factors.
   c. Describe how the quality factor is used to determine dose equivalent.
   d. State why the sievert is the appropriate unit for radiation protection work.
   e. Describe the theory and operation of the following radiation detection devices: ion-chambers, proportional counters, and thermoluminescent dosimeters (TLDs).
   f. List appropriate applications and limitations for each radiation detection device above.
   g. Define units of radiation measurement, and provide an example of radiology application.
   h. Describe the relationship between equipment exposure value and patient dose.
3. Discuss the agencies and regulations involved in radiation safety.
   a. State when a radiation protection survey should be conducted.
   b. Identify who should conduct the survey.
   c. Describe the conditions under which radiation protection surveys of equipment are made.
   d. Identify various performance standards for beam directing, beam defining, and beam limiting devices that are evaluated in a radiation protection equipment survey of the following:
      i. Radiographic equipment
      ii. Fluoroscopic equipment
   e. Describe procedures used to verify performance standards for equipment in objective No. 3d.
   f. Describe the operation of various interlocking systems for equipment in objective No. 3d, and indicate potential consequences of interlock system failure.
   g. List conditions and locations evaluated in an area survey for radiation protection.
   h. Distinguish between controlled and non-controlled areas, and list acceptable exposure levels.
   i. Describe RADIATION AREA signs, and identify appropriate placement sites.
   j. Identify the functions of the following agencies:
      i. International Council on Radiation Protection and Measurements (ICRP)

ii. National Council on Radiation Protection and Measurements (NCRP)
iii. Nuclear Regulatory Commission (NRC)

k. Discuss the Consumer-Patient Radiation Health and Safety Act of 1981and the CARE (Consumer Assurance of Radiologic Excellence) Bill.

l. Describe the function of various state and local regulations governing radiation protection practices.

m. Describe the requirements and responsibilities for a radiation protection officer.

4. Outline the elements of a personnel monitoring program.

a. Identify the need and importance of personnel monitoring for radiation workers.

b. Identify and describe the following monitoring devices:

i. Body badge and ring badge
ii. Thermoluminescent dosimeters (TLDs)
iii. Pocket ionization chambers

c. List applications, advantages, and limitations for each device in objective No. 4b.

d. Interpret personnel monitoring reports.

e. Identify those structures that are considered critical for potential late effects for whole body irradiation exposure.

f. State dose limits with reference to the latest NCRP reports.

5. Identify radiation protection tools and methods.

a. Explain the relationship of beam limiting devices to patient radiation protection.

b. Discuss added and inherent filtration in terms of the effect on patient dosage.

c. Explain the purpose and importance of patient shielding.

d. Correlate the method of shielding to the radiographic procedure using a list of patient shielding devices and radiographic procedures.

e. Explain the relationship of exposure factors to patient dosage.

f. Discuss various photon interactions in terms of description of interaction, relation to atomic number, and applications.

g. Define photodisintegration.

h. State the desired image receptor combination that will result in an optimum diagnostic image with the minimum radiation exposure to the patient using a list of various radiographic procedures.

i. Discuss methods to avoid repeat radiographs.

j. Discuss the importance of clear, concise instructions (effective communication skills) as a method of radiation protection.

k. Discuss the effect(s) of immobilization techniques to eliminate voluntary motion.

l. Describe the minimum source-to-tabletop distances for fixed and mobile fluoroscopes.

m. Discuss safety factors for the patient (and other patients) in the room during mobile radiographic procedures.

6. Utilize concepts of practical radiation protection.

a. Describe how isoexposure curves are used for radiation protection.

b. Distinguish between primary and secondary barriers.

c. Describe how the following factors influence the design of X-ray installations:

i. Use (U)
ii. Workload (W)
iii. Occupancy (T)
iv. Distance (d)
v. Material

d. Describe how the operation of various X-ray and ancillary equipment influences radiation safety, and describe the potential consequences of failure of this equipment.

e. Describe how the operation of various X-ray equipment influences radiation safety, and describe the potential of failure of this equipment.

f. Identify who should evaluate the ancillary and X-ray equipment, indicate the frequency with which these evaluations should be made, and indicate how this is related to the quality assurance program for radiation safety.

g. Demonstrate how time, distance, and shielding can be manipulated to keep radiation exposure to a minimum.

h. Perform calculations of exposure with varying time, distance, and shielding.

i. Discuss the relationship between half-value layer/tenth-value layer and shielding design.

j. Identify emergency procedures to be followed during failures of X-ray mechanisms.

ASRT – Radiation Protection

1. List the units and measures used to evaluate radiation exposure.
2. Discuss the agencies and regulations involved in radiation safety.
3. Outline the elements of a personnel monitoring program.
4. Identify radiation protection tools and methods.
5. Apply personnel and patient radiation protection techniques.

Course Number and Course Name: **RGT 132(3-4) Image Production**

Description: This course is a study of the principles involving manipulation of factors controlling and influencing exposure and radiographic quality. Included are the prime factors of radiographic exposure, beam limiting devices, filtration, production and control of scatter and secondary radiation, exposure systems, technical conversions, and problem solving.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Analyze exposure factors to achieve optimum radiographic quality.
   a. Discuss practical considerations in setting imaging standards.
   b. Discuss acceptance limits.
2. Determine exposure factors to achieve optimum radiographic image quality with a minimum radiation exposure to the patient.
   a. Define receptor exposure.
   b. Identify the acceptable range of radiographic exposure.
   c. Analyze relationships of factors affecting radiographic exposure.
3. Determine exposure factors to achieve optimum radiographic contrast with a minimum radiation exposure to the patient.
   a. Define radiographic contrast.
   b. Differentiate between subject contrast and image grayscale (contrast).
   c. Analyze relationships of factors affecting radiographic grayscale (contrast).
4. Determine exposure factors to achieve optimum radiographic spatial resolution detail with a minimum radiation exposure to the patient.
   a. Define spatial resolution.
   b. Differentiate between umbra and penumbra.
   c. Analyze relationships of factors affecting spatial resolution.
5. Determine exposure factors to achieve appropriate radiographic distortion with a minimum radiation exposure to the patient.
   a. Define distortion.
   b. Differentiate between shape distortion and size distortion.
   c. Analyze relationships of factors affecting distortion.
6. Determine exposure factors to achieve optimum exposure latitude with a minimum of radiation exposure to the patient.
   a. Define exposure latitude.
   b. Analyze relationships of factors affecting exposure latitude.
7. Use X-ray beam restrictors for radiation protection and optimal radiographic quality.
   a. List the types of beam limiting devices, and describe the operation and applications for each.
   b. Explain purposes of beam limiting devices in terms of patient dosage, scattered radiation production, radiographic density, and contrast.
8. Use X-ray beam filtration for radiation protection and optimal radiographic quality.
   a. Define beam filtration.
   b. Explain purposes of beam filtration in terms of patient dosage, scattered radiation production, radiographic density, and contrast.
9. Recognize the effects of scattered and secondary radiation on the radiographic image and patient dosage.
   a. Define scattered and secondary radiation.
   b. Describe interactions of X-rays with matter that produce scattered and secondary radiation.
   c. Analyze relationships of factors affecting scattered and secondary radiation.
   d. Discuss effects of scattered and secondary radiation in terms of patient dosage, image quality, and occupational

exposure.

10. Utilize devices to control exit radiation.
    a. Explain the relationship between kVp and scattered and secondary radiation.
    b. Describe a grid in terms of its purpose, components, and construction.
    c. Differentiate among types of grids.
    d. Analyze grid efficiency in terms of grid ratio and frequency.
    e. Given technical information, select an appropriate grid.
    f. Define grid cutoff.
    g. Describe factors influencing grid cutoff.
    h. Describe various grid artifacts.
    i. Explain the relationship between beam limitation and scattered and secondary radiation.
11. Utilize various imaging systems with consideration for radiation protection and radiographic quality.
    a. Explain the purpose of an exposure system in terms of standardization of exposure and image consistency.
    b. Discuss considerations involved in exposure selection.
    c. Distinguish among various types of exposure systems.
    d. Demonstrate patient measurement and exposure selection given clinical simulations.
12. Perform mathematical calculations and measurement conversions used in radiologic technology.
    a. Analyze relationships of exposure factors and their effects on exposure calculations.
    b. Calculate the photographic effect given exposure factors.
    c. Calculate penumbra, magnification factor, and percent magnification given exposure problems.
    d. Apply Mas reciprocity to clinical situations.

ASRT – Image Production

1. Explain exposure factors and their effect on the final image.
2. Describe the image acquisition process and associated errors.
3. Recognize the purpose and management of exposure factors.
4. Discuss the computer processing and image display process.
5. Apply quality management techniques and programs.
6. Recognize the mechanisms for transfer, storage, and remote assessment of medical images.
7. List common downtime procedures for radiologic technologists.

Course Number and Course Name: **RGT 1333 Digital Image Analysis**

Description: Content imparts an understanding of the components, principles and operation of digital imaging systems found in diagnostic radiology. Factors that impact image acquisition, display, archiving and retrieval are discussed. Principles of digital system quality assurance and maintenance are presented.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	2	2	60
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Discuss the fundamentals of digital radiography.
   a. Define terminology associated with digital imaging systems.
   b. Describe the various types of digital receptors.
   c. Describe the fundamental physical principles of exposure for digital detectors.
   d. Describe and apply appropriate digital technical factors.
   e. Define Teleradiography.
2. Compare the image acquisition and extraction.
   a. Compare the advantages and limits of each system.
   b. Describe the evaluative criteria for digital radiography detectors.
   c. Describe the response of digital detectors to exposure variations.
   d. Describe the histogram and the process or histogram analysis as it relates to automatic rescaling and determining an exposure indicator.
   e. Compare dynamic range to latitude of a screen/film receptor system to that of a digital radiography system.
   f. Given the performance criteria for a digital radiography detector, evaluate the spatial resolution and dose effectiveness.
   g. Describe or identify the exposure indices used by each photostimulable phosphor (PSP)- based system.
   h. Employ appropriate beam/part/receptor alignment to avoid histogram analysis errors.
   i. Describe the various image processing employed for digital images.
   j. Evaluate the effect of a given exposure change on histogram shape, data width, and image appearance.
   k. Associate impact of image processing parameters to the image appearance.
   l. Discuss image informatics and archiving as well as down- time procedures.
3. Compare between dose area product (DAP) measured and flat panel system vs. the exposure index for a PSP-based system.
   a. Identify common limitations and technical problems encountered when using PSP systems.
   b. Relate the receptor exposure indicator values to technical factors, system calibration, part/beam/plate alignment, and patient exposure.
   c. Describe image acquisition precautions necessary for CR imaging.
   d. Describe the response of PSP systems to background and scatter radiation.
4. Associate effects of inappropriate processing on image clarity or conspicuity.
   a. Describe the selection of technical factors and technical factor systems to assure appropriate receptor exposure levels for digital detectors.
   b. Describe the conditions that cause quantum mottle in a digital image.
   c. Utilize appropriate means of scatter control.
   d. Describe how to avoid grid errors associated with grid cutoff and Moiré effect.
   e. Formulate a procedure or process to minimize histogram analysis and rescaling errors.
   f. Identify operator postprocessing functions such as: Windowing, spatial domain processing, spatial frequency process, image reformatting.
5. Define medical image management and processing system (MIMPS) standards (formerly picture archiving and communication systems PACS).

a. Describe Picture Archival and Communications System MIMP and its function.
b. Identify components of a MIMP system.
c. Describe patient benefits gained through the use of teleradiology.
d. Identify modality types that may be incorporated into a MIMP.
e. Define accession number.
f. Describe worklist and correct usage.
g. Describe how an image is associated with a radiology order to create a DICOM image.
h. Describe data flow for a DICOM image from an imaging modality to a MIMP.
i. Describe HIPPA concerns with electronic information.
j. Identify common problems associated with retrieving/viewing images within MIMP.
k. Identify the primary uses of the diagnostic display workstation and clinical display workstation.

6. Discuss Quality Management.
   a. Define and discuss continuous quality improvement (CQI), quality assurance and maintenance of imaging systems and display as it relates to patient safety and exposure.
   b. Evaluate the potential impact of digital radiographic systems on patient exposure and methods of practicing the as low as reasonably achievable (ALARA) concept with digital systems.
   c. Describe the exposure precautions and limitations associated with PSP-based systems.
   d. Describe how to avoid poor quality images by observing acquisition precautions.
   e. Describe process of troubleshooting equipment.

ASRT – Image Analysis

1. List image appearance standards.
2. Justify the need for imaging standards.
3. Explain technical, procedural, and clinical factors affecting image appearance.
4. Recognize patient-related and equipment-related artifacts.
5. Describe corrective actions that can be taken to improve image appearance.

ASRT – Image Production

1. Explain exposure factors and their effect on the final image.
2. Describe the image acquisition process and associated errors.
3. Recognize the purpose and management of exposure factors.
4. Discuss the computer processing and image display process.
5. Apply quality management techniques and programs.
6. Recognize the mechanisms for transfer, storage, and remote assessment of medical images.
7. List common downtime procedures for radiologic technologists.

Course Number and Course Name: **RGT 151(3-4) Radiographic Procedures I**

Description: This course includes terminology, principles, and procedures involved in routine radiographic positioning for demonstration of radiographic procedures at the current programmatic level. Included is a review of radiographic anatomy on each procedure.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	2	2	60
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Identify basic radiographic positioning skills.
   a. Define the following radiographic terms:
      (1) View
      (2) Position
      (3) Projection
   b. Define various terms of position.
   c. Describe various positioning aids, and discuss the application and advantages and disadvantages of each.
   d. Describe various accessory equipment, and discuss each in terms of function and application.
2. Discuss general procedural considerations for radiographic examinations.
   a. Discuss general considerations for radiographic procedures.
   b. Explain the general considerations involved in various radiographic procedures using clinical simulations.
   c. Demonstrate general considerations involved with various radiographic procedures through role- playing.
   d. Discuss positioning considerations for radiographic procedures.
   e. Explain the positioning considerations involved for various radiographic procedures given clinical simulations.
   f. Demonstrate positioning considerations involved with various radiographic procedures through role-playing.
3. Identify positioning considerations for routine radiographic procedures.
   a. Describe routine and special views of the abdominal cavity in terms of structure(s) visualized and function(s) demonstrated including general and positioning considerations.
   b. Identify areas of the abdomen including the following:
      (1) Abdominal regions
      (2) Abdominal quadrants
   c. Explain the structure(s) visualized and function(s) demonstrated including general and positioning considerations involved for routine and special views of the abdominal cavity given clinical simulations.
   d. Simulate radiographic procedures related to the abdominal cavity in a laboratory environment.
   e. Evaluate given radiographs of body cavities in terms of positioning accuracy and image quality.
   f. Describe routine and special views of the skeletal system relating to the upper extremities in terms of structure(s) visualized and function(s) demonstrated, including general and positioning considerations.
   g. Explain the structure(s) visualized and function(s) demonstrated, including general and positioning considerations given clinical simulations for routine and special views of the skeletal system relating to the upper extremities and shoulder girdle.
   h. In a laboratory environment, simulate radiographic procedures of the skeletal system relating to the upper extremities.
   i. Evaluate radiographs of various parts of the skeletal system relating to the upper extremities in terms of positioning accuracy and image quality.
   j. Describe routine and special views of the respiratory system in terms of structure(s) visualized and function(s) demonstrated including general and positioning considerations.
   k. Explain the structure(s) visualized and function(s) demonstrated including general and positioning

considerations involved for routine and special views of the respiratory system given clinical simulations.
l. Simulate radiographic procedures related to the respiratory system in a laboratory environment.
m. Evaluate radiographs of various parts of the respiratory system in terms of positioning accuracy and image quality.

4. Identify positioning considerations for routine contrast studies.
   a. Discuss equipment and supplies necessary for contrast studies identified in this course.
   b. Describe patient preparation necessary for various contrast studies.
   c. Describe the general procedure for each of the radiographic studies identified in this course.
   d. Describe routine and special views of the digestive system and accessory organs in terms of structure(s) visualized and function(s) demonstrated including general and positioning considerations.
   e. Explain the structure(s) visualized and function(s) demonstrated including general and positioning considerations involved for routine and special views of the digestive system and accessory organs given clinical simulations.
   f. In a laboratory environment, simulate radiographic procedures related to the digestive system and accessory organs.
   g. Evaluate radiographs of various parts of the digestive system and accessory organs in terms of positioning accuracy and image quality.
5. Identify procedural considerations for special studies.
   a. Apply a working knowledge of gastrointestinal contrast media currently used in the radiology department.
   b. Identify the possible actions and reactions of gastrointestinal contrast media used in health-care institutions.
   c. Define the categories of gastrointestinal contrast media, and give specific examples for each category.
   d. Discuss the pharmacology of barium compounds in regard to the following:
      (1) Patient history and allergy
      (2) Chemical composition
      (3) Patient precautions
      (4) Patient reactions
      (5) Emergency care
   e. Describe methods of administering gastrointestinal contrast media, and discuss administration techniques for each method.
6. Identify positioning considerations for mobile and/or trauma radiography for those areas of the body included in this course.
   a. Describe alternate positions for mobile and trauma procedures.
   b. Identify the locks and control panel components on a mobile radiography unit.
   c. Describe special radiation protection considerations when performing mobile and/or trauma radiography.
7. Identify General Radiographic and Patient Considerations.
   a. Evaluate radiographic orders.
      (1) Two means of patient identifiers
      (2) Verification of procedures ordered
      (3) Obtain clinical history and assess the patient
      (4) Sequence exams properly
   b. Demonstrate proper room preparation.
   c. Establish patient rapport.
   d. Demonstrate proper patient preparation.
   e. Demonstrate proper patient assistance.
   f. Demonstrate proper patient monitoring.
   g. Demonstrate proper patient discharge.

ASRT – Image Analysis

1. List image appearance standards.
2. Justify the need for imaging standards.
3. Explain technical, procedural, and clinical factors affecting image appearance.
4. Recognize patient-related and equipment-related artifacts.
5. Describe corrective actions that can be taken to improve image appearance.

ASRT - Radiographic Procedures

1.Discuss radiographic technique using anatomic, positioning, and projection terminology.

2.Evaluate radiographic orders and preparation for procedures.
3.Describe patient communication techniques and planning.
4.Apply patient positioning techniques for common exams.
5.Conduct contrast studies, including patient preparation and positioning.
6.Recognize special concerns and techniques for mobile and surgical radiography.

Course Number and Course Name: **RGT 1523 Radiographic Procedures II**

Description: This course includes terminology, principles, and procedures involved in routine radiographic positioning for demonstration of radiographic procedures at the current programmatic level. Included is a review of radiographic anatomy on each procedure. This is a continuation of Radiographic Procedures I.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	2	2	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Identify positioning considerations for routine radiographic procedures.
   a. Describe routine and special views of the skeletal system relating to the pelvic girdle, lower extremities, bony thorax, and the spinal column in terms of structure(s) visualized and function(s) demonstrated including general and positioning considerations involved.
   b. Explain the structure(s) visualized and function(s) demonstrated including general and positioning considerations involved using clinical simulations and routine and special views of the skeletal system relating to the pelvic girdle, lower extremities, bony thorax, and spinal column to include scoliosis survey.
   c. In a laboratory environment, simulate radiographic procedures of the skeletal system relating to the pelvic girdle, lower extremities, bony thorax, and spinal column.
   d. Evaluate radiographs of various parts of the skeletal system relating to the pelvic girdle, lower extremities, bony thorax, and spinal column, in terms of positioning accuracy and image quality.
   e. Describe routine and special views of the urinary system in terms of structure(s) visualized and function(s) demonstrated including general and positioning considerations.
   f. Explain the structure(s) visualized and function(s) demonstrated including general and positioning considerations involved for routine and special views of the urinary system given clinical simulations.
   g. Simulate procedures related to the urinary system in a laboratory environment.
   h. Evaluate radiographs of various parts of the urinary system in terms of positioning accuracy and image quality.
2. Identify positioning considerations for mobile and trauma radiography for those areas of the body included in this course.
   a. Describe alternate positions for mobile and trauma procedures.
   b. Identify the locks and control panel components on a mobile radiography unit.
   c. Describe special radiation protection considerations when performing mobile radiography.
   3. Demonstrate the drug administration procedure.
   a. Identify and describe the routes of drug administration.
   b. Discuss the purposes and advantages of intravenous drug administration over other routes.
   c. Differentiate between the two major sites of intravenous drug administration.
   d. Identify, describe, and document complications associated with intravenous drug administration and appropriate actions to resolve these complications.
   e. Discuss the various elements of initiating and discontinuing intravenous drug administration.
   f. Differentiate and document dose calculations for adult and pediatric patients.
   g. Prepare contrast agents and intravenous medications for injection utilizing aseptic technique.
   h. Discuss the radiographer's role in contrast media and drug administration.
3. Demonstrate the drug administration procedure.
   a. Identify and describe the routes of drug administration.
   b. Discuss the purposes and advantages of intravenous drug administration over other routes.
   c. Differentiate between the two major sites of intravenous drug administration.
   d. Identify, describe, and document complications associated with intravenous drug administration and appropriate actions to resolve these complications.
   e. Discuss the various elements of initiating and discontinuing intravenous drug administration.

f. Differentiate and document dose calculations for adult and pediatric patients.
g. Prepare contrast agents and intravenous medications for injection utilizing aseptic technique.
h. Discuss the radiographer's role in contrast media and drug administration.

4. Identify General Radiographic and Patient Considerations.
   a. Evaluate radiographic orders.
      (1) Two means of patient identifiers
      (2) Verification of procedures ordered
      (3) Obtain clinical history and assess the patient
      (4) Sequence exams properly
   b. Demonstrate proper room preparation.
   c. Establish patient rapport.
   d. Demonstrate proper patient preparation.
   e. Demonstrate proper patient assistance.
   f. Demonstrate proper patient monitoring.
   g. Demonstrate proper patient discharge.

ASRT - Radiographic Procedures

1. Discuss radiographic technique using anatomic, positioning, and projection terminology.
2. Evaluate radiographic orders and preparation for procedures.
3. Describe patient communication techniques and planning.
4. Apply patient positioning techniques for common exams.
5. Conduct contrast studies, including patient preparation and positioning.
6. Recognize special concerns and techniques for mobile and surgical radiography.

ASRT – Image Analysis

1. List image appearance standards.
2. Justify the need for imaging standards.
3. Explain technical, procedural, and clinical factors affecting image appearance.
4. Recognize patient-related and equipment-related artifacts.
5. Describe corrective actions that can be taken to improve image appearance.

Course Number and Course Name: **RGT 1613 Physics of Imaging Equipment**

Description: This course is designed to establish knowledge based in radiographic, fluoroscopic, mobile, and tomographic equipment requirements and design. The content will also provide a basic knowledge of quality control. Computer applications in the radiologic sciences related to image capture, display, storage, and distribution are presented.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45
4	4	0	60
4	3	2	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe the structure of atoms and the electromagnetic spectrum.
   a. Describe the structure of an atom including the nucleus and other subatomic structures.
   b. Identify the electron shells to include the binding energies.
   c. Define atomic number and mass number.
   d. Identify the types of radiation on the electromagnetic spectrum.
      (1) Wave-particle duality
      (2) Properties (e.g., frequency, wavelength, energy, velocity)
   e. Identify ionizing (excitation) vs. ionizing radiation.
   f. Define particulate radiation.
   g. Define/describe radioactivity (decay) of Alpha emission, Beta emission, Gamma emission, and Half-life (T1/2).
2. Describe X-ray production, and the effect of various factors.
   a. Introduce the history of creating an X-ray beam.
   b. State the principles of X-ray production.
   c. Compare the production of bremsstrahlung with the production of characteristic radiations.
   d. Describe the conditions necessary to produce x-radiation.
   e. Define and describe wavelength and frequency and how they are related to velocity.
   f. Describe the electromagnetic spectrum.
   g. Define the factors affecting the X-ray emission spectrum (e.g., kVp, mA, Time, atomic number of the target, filtration, generator phase).
   h. Describe the X-ray beam characteristics.
      (1) Quality
      (2) Quantity
      (3) Primary versus remnant (exit)
   i. Define leakage radiation versus off-focus/stem radiation.
3. Describe X-ray photon interaction with matter.
   a. Describe how an X-ray photon becomes exit/remnant radiation.
   b. Define and describe different X-ray interactions with matter/tissue:
      (1) Unmodified scattering (coherent or classical)
      (2) Photoelectric
      (3) Compton
      (4) Pair production
   c. Describe the probability of photon interactions based on atomic number, energy, tissue volume and part thickness.
   d. Describe how each type of interaction affects the image as well as patient and operator dose effects.
4. Identify the different parts of the X-ray circuit.
   a. Define potential difference, current, and resistance.
   b. Describe the characteristics of direct and alternating currents.

c. Explain electrical protective devices including ground and circuit breaker.
d. Define transformers and explain what step-up and step-down transformers as well as autotransformers do.
e. Identify the general components and function of the primary and secondary filament circuits and X-ray tubes.
f. Identify the function of solid-state rectification.
g. Compare single-phase, three-phase, high frequency, and falling load generators in terms of radiation production and efficiency.

5. Identify the different types of radiographic equipment.
   a. Discuss the fixed installation of radiographic equipment in terms of purpose, components, types, and applications.
   b. Discuss mobile units in terms of purpose, components, types, and applications.
   c. Identify general radiation protection rules related to the installation of new radiographic equipment.
   d. Discuss the application of automatic exposure devices to include:
      (1) Radiation detectors (ionization chamber vs. solid state)
      (2) Minimum response time and backup time
      (3) Alignment and positioning considerations as well as compensation issues
   e. Define the construction of an X-ray tube as well as how to extend tube life.
   f. Explain image-intensified fluoroscopy.
   g. Discuss flat panel detectors to include:
      (1) Detective quantum efficiency (DQE)
      (2) Modulation transfer function (MTF) including line spread function (LSF), point spread function (PSF), and edge spread function (ESF)
      (3) Contrast-to-noise ratio (CNR)
      (4) Binning
      (5) File sizes and data management
      (6) Imaging monitoring (CCD or CMOS
   h. Describe image viewing such as last-image hold (LIH), last-sequence-display, and display monitors.
   i. Discuss gain and conversion factors as related to intensification.
   j. Discuss image formation in terms of image size and brightness.
   k. Indicate the purpose, construction, and application of video camera tubes, TV monitors, and video records.
   l. Identify the purpose, construction, and application of cine radiographic equipment as well as digital subtraction and unsubtracted imaging.
   m. Discuss electronic imaging equipment used in radiography and fluoroscopy.
   n. Discuss flat panel detectors used in digital electronic X-ray equipment.
6. Define and Describe the quality control of Imaging equipment and accessories.
   a. List the benefits of a quality management program to the patient and to the department.
   b. List elements of a quality management program, and discuss how each is related to the quality management program.

ASRT - Imaging Equipment

1. Describe potential difference, current and resistance.
2. Describe the general components and function of the x-ray circuit to include the tube and filament circuits.
3. Compare generators in terms of radiation produced and efficiency.
4. Discuss fixed and mobile radiographic equipment in terms of purpose, components, types and applications.
5. Demonstrate operation of various types of fixed and mobile radiographic equipment.
6. Describe the components and function of automatic exposure control (AEC) devices.
7. Demonstrate proper use of AEC devices.
8. Describe the components and function of diagnostic x-ray tubes.
9. Explain methods used to extend x-ray tube life.
10. Discuss fixed and mobile fluoroscopic equipment in terms of purpose, components, types and applications.
11. Explain image-intensified, flat panel and pulsed fluoroscopy.
12. Indicate the purpose, construction and application of the fluoroscopic monitor.
13. Discuss quality control (QC) for imaging equipment and accessories.
14. Evaluate the results of standard QC tests.
15. Identify common equipment malfunctions that affect image quality, and corrective action.
16. Differentiate between technical factor problems, procedural factor problems and equipment malfunctions.

ASRT – Radiation Production and Characteristics

1. Describe the structure of atoms and types of radiation.
2. Explain x-ray production and the effect of various factors.
3. Discuss photon interactions with matter.
4. Diagram the elements of the x-ray circuit and x-ray tube.
5. Employ radiographic equipment of various types.
6. Describe the elements and operation of fluoroscopy systems.
7. Apply quality control measures to imaging equipment and accessories.

Course Number and Course Name: **RGT 2132 Ethical and Legal Responsibilities**

Description: Legal terminology, concepts, and principles will be presented in this course. Topics include misconduct, malpractice, legal and professional standards, and the ASRT scope of practice. The importance of proper documentation and informed consent is emphasized. This course will prepare students to better understand their patients, the patients' families, and professional peers through comparison of diverse populations based on their value systems, cultural and ethnic influences, communication styles, socioeconomic influences, health risks, and life stages.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1	1	0	15
2	2	0	30
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply medical and professional ethics in the context of a broader society.
   a. Examine the interrelationship between personal, community, and societal values.
   b. Explain the influence a person's value system has on his or her behavior.
   c. Examine how professional values are imparted.
   d. Assess the effect of a conflict between a patient's values and a health professional's values on the resultant care that a patient may receive.
   e. Discuss morality and its development.
   f. Contrast culture and ethnicity, and provide examples of each.
   g. Explain how a person's cultural bias toward illness affects his or her recovery.
   h. Explain the roots of medical ethnocentrism.
   i. Discuss the societal factors that influence the quality of health care a patient may receive.
   j. Describe the culture of poverty and the effect and delivery on the health-care system.
   k. Discuss the patient advocacy role of the health professional in relation to effective patient communication.
   l. Discuss the importance of understanding verbal and nonverbal communications in various cultures.
2. Discuss the appropriate physical boundaries in relation to touching with no formal consent.
   a. Compare pity, sympathy, and empathy in relation to a patient's situation.
   b. Discuss family dynamics in a cultural, social, ethnic, and lifestyle sense.
   c. Identify the types of consent.
      (1) Describe the elements and implications of informed consent
      (2) Identify standards for disclosure relative to informed consent
      (3) Describe how consent forms are utilized relative to specific radiographic procedures
3. Identify legal and professional standards and their relationship to practice in health professions.
   a. Describe accepted codes or guidelines for professional ethics in their chosen health profession.
   b. Identify specific ethical situations and dilemmas in health care that may impact the radiographer.
   c. Employ a basic system of examination, clarification, determination of alternatives, and decision making in addressing ethical questions and situations.
   d. Explain select concepts embodied in principles of patients' rights, the doctrine of informed (patient) consent, and other issues related to patients' rights.
   e. Identify the legal implications of professional liability, malpractice, professional negligence and carelessness, and other legal doctrines applicable to professional practice.
   f. Discuss the importance of accurate, complete, and correct methods of documentation as a legal and ethical imperative.
   g. In groups and individually, explore responses to theoretical situations and questions relating to the ethics of care and health-care delivery.

h. Explain specific legal terms, principles, and laws.
i. Identify the elements necessary for valid malpractice claim.
j. Define specific legal doctrines to include vicarious liability, respondeat superior, and res ipsa loquitur.
k. Describe the ASRT Scope of Practice for the radiographer, the elements that comprise it, and the responsibilities of the radiographer.
l. Differentiate between professional and legal standards, and describe how each relates to radiography practice.
m. Identify institutional and professional liability protection typically available to the radiographer.
n. Contrast and compare pity, sympathy, and empathy in relation to patient's situation.

ASRT - Ethics and Law in the Radiologic Sciences

1. Describe the basis of ethics and characteristics of ethical behavior.
2. List ethical dilemmas and ethically-complex areas of health care and medical imaging.
3. Discuss the basis of law and major legal concerns in health care.
4. Explain the types of consent, as well as the conditions and documentation of consent.

Course Number and Course Name: **RGT 214(6-7) Clinical Education IV**

Description: This course is a clinical practice and instruction in a clinical affiliate. Areas included are patient care and management, radiation protection, operation of equipment, and radiologic procedures. This is a continuation from Clinical Education I, II, and III.

Hour Breakdown:

Semester Credit Hours	Lecture	Clinical	Contact Hours
6	0	18	270
7	0	21	315

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply radiographic principles in the clinical setting with respect to program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition, and carry out appropriate actions.
   b. Manage interaction with the patient and family in a manner that provides the desired psychosocial support.
   c. Provide patient and family education appropriate to the comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic X-ray production and interactions.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions, and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics, and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
   r. Adhere to concepts of team practice that focus on organizational theories, roles of team members, and conflict resolution.
   s. Evaluate procedure orders for accuracy, and follow up to make corrective changes.
   t. Exercise independent judgment and discretion in the technical performance of medical imaging procedures.
   u. Establish patient centered clinically effective service for all patients regardless of age, gender, disability, ethnicity, and culture.
   v. Differentiate among gender, cultural, age, and socioeconomic related factors that influence patient compliance with procedures, diagnosis, treatment, and follow-up of patients.
   w. Adapt procedures to meet age-specific, disease-specific, and cultural needs of patients.
   x. Interpret patient side effects and complications of radiologic procedures, contrast administration and other procedures, and take appropriate actions.
   y. Document care in the patient's record.
2. Perform clinical application skills for radiographic procedures.
   a. Practice routine radiographic procedures including the following:
      (1) Cranium procedures
         a) Skull
         b) Facial bones
         c) Nasal bones
         d) Orbits

e) Mandible
f) Temporomandibular joints
g) Paranasal sinuses
(2) Procedural adjustments for trauma
(3) Advanced mobile (portable) radiography

b. Perform image analysis on the following:
(1) Routine Cranium procedures
a) Skull
b) Facial bones
c) Nasal bones
d) Orbits
e) Mandible
f) Temporomandibular joints
g) Paranasal sinuses
(2) Procedural adjustments for trauma
(3) Advanced mobile (portable) radiography

3. Demonstrate tasks associated with radiographic procedures.
a. Perform routine radiographic procedures including the following:
(1) Bony thorax
(2) Mobile (portable) radiography
b. Perform advanced radiographic procedures including the following:
(1) Spinal column
(2) Pelvic girdle
(3) Lower extremities
(4) Urinary systems
(5) Evaluate Image Analysis
c. Demonstrate technical adjustments to accommodate trauma procedures.

4. Discuss medical and professional culture and diversity.
5. Acknowledge the Standards of Ethics and professional behavior.
a. Abide by ARRT standards of Ethics and Professional behavior.
b. Abide by student supervision policies (Direct and Indirect).
c. Acknowledge the patient's expectations, rights, and responsibilities.
d. Abide by radiographer's professional responsibilities.
6. Demonstrate Professional Communication.
a. Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
b. Demonstrate professional communication with all health care professionals.
c. Demonstrate proper confidentiality of patient's records (HIPAA compliance).
7. Acknowledge Radiography Practice Standards.
a. Abide by the Scope of practice, clinical, quality, and professional performance standards.
b. Acknowledge ASRT's Advisory and Best Practices in Digital Radiography.
8. Acknowledge Personal, Society, and Professional Values.
a. Recognize how values are developed.
b. Recognize the effect of personal, society, professional values on the patient care.
c. Recognize the effect of social media on professional values.
d. Recognize how value conflicts can be resolved.
9. Acknowledge Diversity, equity, and inclusion.
a. Examine the diversity concepts between personal, community, and societal values.
b. Discuss socioeconomic factors.
c. Identify culture, race, and ethnicity.
d. Recognize gender identity/expression.
e. Recognize differences in age groups.
(1) Infant
(2) Child
(3) Adolescent

(4) Adult
(5) Middle-age
(6) Geriatric

f. Recognize different family structures and dynamics.
g. Recognize differences in diversity based on geographical factors.
h. Examine relationships of individuals with regards to differences in religion, spirituality, belief system, lifestyle choices and behaviors, sexual orientation and disability.
i. Recognize equity in relation to structural racism and social justice.
j. Recognize the culture of inclusion in relation to the environment and organizations.

10. Practice Procedural Performance.
a. Acknowledge Scheduling and Sequencing of exams.
b. Evaluate Order/Requisition and Corrective measures.
c. Identify Facility Set-ups.
d. Demonstrate Patient Assessment, clinical history, education, and care.
(1) Demonstrate Patient Monitoring (Emergency and Non-Emergency).
a) Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
b) Demonstrate professional communication with all health care professionals.
c) Demonstrate proper confidentiality of patient's records (HIPAA compliance).
(2) Demonstrate Patient Privacy and Confidentiality (HIPAA).
(3) Practice Proper Documentation.
(4) Demonstrate Infection Control.
a) Personal Protective Equipment (PPE)
i. Types
ii. Proper Use
(5) Demonstrate Patient Education.
a) Appropriate Communication
b) Age-Specific
c) Cultural Sensitivity
d) Socioeconomic Sensitivity
e) Patient-Centered Care
(6) Recognize ways to reduce medical error.
(7) Recognize Patient Safety Considerations.
e. Practice Imaging Considerations.
(1) Identify Positioning Considerations.
(2) Identify Technical Considerations.
(3) Practice Image Acquisition.
(4) Practice Image Analysis.
f. Practice Radiation Protection.
(1) Practice Protection Principles (ALARA).
(2) Practice Radiation Safety.
a) Protection of the patient (AAPM recommendations).
b) Protection of personnel.
c) Protection of others.
(3) Practice Protection Education for the following:
a) Patient, family members, or authorized representatives
b) Other members of the healthcare team
g. Recognize Proper Protection Equipment and Accessories.

11. Recognize Clinical Competencies.

ASRT - Clinical Practice

1. Discuss ethics and the characteristics of professional behavior.
2. Apply professional communication techniques.

3. List the radiography practice standards.
4. Demonstrate positive values and a commitment to diversity, equity, and inclusion.
5. Explain the elements of procedural performance and radiation protection.
6. Recognize the requirements for clinical competency.

Course Number and Course Name: **RGT 215(6-7) Clinical Education V**

Description: This course is a clinical practice and instruction in a clinical affiliate. Areas included are patient care and management, radiation protection, operation of equipment, and radiologic procedures. This is a continuation from Clinical Education I, II, III, and IV.

Hour Breakdown:

Semester Credit Hours	Lecture	Clinical	Contact Hours
6		18	270
7		21	315

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply radiographic principles in the clinical setting with respect to program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition, and carry out appropriate actions.
   b. Manage interaction with the patient and family in a manner that provides the desired psychosocial support.
   c. Provide patient and family education appropriate to the comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic X-ray production and interactions.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   n. Demonstrate safe, ethical, and legal practices.
   o. Abide by the profession's code of ethics, and comply with the recognized scope of practice for the profession.
   p. Practice standard precautions at all times.
   q. Adhere to concepts of team practice that focus on organizational theories, roles of team members, and conflict resolution.
   r. Evaluate procedure orders for accuracy, and follow up to make corrective changes.
   s. Exercise independent judgment and discretion in the technical performance of medical imaging procedures.
   t. Establish patient-centered, clinically effective service for all patients regardless of age, gender, disability, ethnicity, and culture.
   u. Differentiate gender, cultural, age, and socioeconomic related factors that influence patient compliance with procedures, diagnosis, treatment, and follow-up of patients.
   v. Adapt procedures to meet age-specific, disease-specific, and cultural needs of patients.
   w. Interpret patient side effects and complications of radiologic procedures, contrast administration, and other procedures, and take appropriate actions.
   x. Document care in the patient's record.
   y. Differentiate between normal ECG rhythms and abnormal ECG tracings.
   z. Apply the principles of total quality management.
      1) Report equipment malfunctions to assist with appropriate corrective actions.
2. Demonstrate tasks associated with radiographic procedures.
   a. Perform radiographic procedures including the following:
      1) Reproductive system
   b. Perform advanced radiographic procedures including the following:

1) Spinal column
2) Pelvic girdle
3) Lower extremities
4) Urinary systems
5) Routine cranium procedures
    a) Skull
    b) Facial bones
    c) Nasal bones
    d) Orbits
    e) Mandible
    f) Temporomandibular Joints
    g) Paranasal Sinuses
6) Evaluate Image Analysis

c. Demonstrate technical adjustments to accommodate trauma procedures.

3. Integrate didactic and clinical competencies to perform radiographic procedures.
    a. Demonstrate knowledge of anatomy, physiology, positioning, and radiographic techniques to accurately demonstrate anatomical structures on a radiograph or other imaging receptor.
    b. Determine exposure factors to achieve optimum radiographic techniques with minimum radiation exposure to the patient.
    c. Evaluate radiographic images for appropriate positioning and image quality.
    d. Apply the principles of radiation protection to the patient, self, and others.
    e. Provide patient care and comfort.
    f. Recognize emergency patient conditions; initiate lifesaving first aid and basic life support.
    g. Detect equipment malfunctions; report same to the proper authority, and know the safe limits of equipment operation.
    h. Exercise independent judgment and discretion in the technical performance of medical imaging procedures.
    i. Participate in radiologic quality assurance programs.
    j. Provide patient and public education related to radiologic procedures and radiation protection and safety.
4. Discuss medical and professional culture and diversity.
    5. Acknowledge the Standards of Ethics and professional behavior.
        a. Abide by ARRT standards of Ethics and Professional behavior.
        b. Abide by student supervision policies (Direct and Indirect).
        c. Acknowledge the patient's expectations, rights, and responsibilities.
        d. Abide by radiographer's professional responsibilities.
    6. Demonstrate Professional Communication.
        a. Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
        b. Demonstrate professional communication with all health care professionals.
        c. Demonstrate proper confidentiality of patient's records (HIPAA compliance).
    7. Acknowledge Radiography Practice Standards.
        a. Abide by the Scope of practice, clinical, quality, and professional performance standards.
        b. Acknowledge ASRT's Advisory and Best Practices in Digital Radiography.
    8. Acknowledge Personal, Society, and Professional Values.
        a. Recognize how values are developed.
        b. Recognize the effect of personal, society, professional values on the patient care.
        c. Recognize the effect of social media on professional values.
        d. Recognize how value conflicts can be resolved.
    9. Acknowledge Diversity, equity, and inclusion.
        a. Examine the diversity concepts between personal, community, and societal values.
        b. Discuss socioeconomic factors.
        c. Identify culture, race, and ethnicity.
        d. Recognize gender identity/expression.
        e. Recognize differences in age groups.
            1) Infant
            2) Child

3) Adolescent
4) Adult
5) Middle-age
6) Geriatric

f. Recognize different family structures and dynamics.
g. Recognize differences in diversity based on geographical factors.
h. Examine relationships of individuals with regards to differences in religion, spirituality, belief system, lifestyle choices and behaviors, sexual orientation and disability.
i. Recognize equity in relation to structural racism and social justice.
j. Recognize the culture of inclusion in relation to the environment and organizations.

10. Practice Procedural Performance.
    a. Acknowledge Scheduling and Sequencing of exams.
    b. Evaluate Order/Requisition and Corrective measures.
    c. Identify Facility Set-ups.
    d. Demonstrate Patient Assessment, clinical history, education, and care.
        1) Demonstrate Patient Monitoring (Emergency and Non-Emergency).
            a) Demonstrate professional communication with patients and their family members (i.e. authorized representatives).
            b) Demonstrate professional communication with all health care professionals.
            c) Demonstrate proper confidentiality of patient's records (HIPAA compliance).
        2) Demonstrate Patient Privacy and Confidentiality (HIPAA).
        3) Practice Proper Documentation.
        4) Demonstrate Infection Control.
            a) Personal Protective Equipment (PPE)
                i. Types
                ii. Proper Use
                iii. Demonstrate Patient Education
            b) Appropriate Communication
            c) Age-Specific
            d) Cultural Sensitivity
            e) Socioeconomic Sensitivity
            f) Patient-Centered Care
                iv. Recognize ways to reduce medical error
                v. Recognize Patient Safety Considerations
    e. Practice Imaging Considerations.
        1) Identify Positioning Considerations
        2) Identify Technical Considerations
        3) Practice Image Acquisition
        4) Practice Image Analysis
    f. Practice Radiation Protection.
        1) Practice Protection Principles (ALARA).
        2) Practice Radiation Safety.
            a) Protection of the patient (AAPM recommendations)
            b) Protection of personnel
            c) Protection of others
        3) Practice Protection Education for the following:
            a) Patient, family members, or authorized representatives
            b) Other members of the healthcare team
    g. Recognize Proper Protection Equipment and Accessories.
11. Recognize Clinical Competencies.

ASRT - Clinical Practice

1. Discuss ethics and the characteristics of professional behavior.
2. Apply professional communication techniques.

3. List the radiography practice standards.
4. Demonstrate positive values and a commitment to diversity, equity, and inclusion.
5. Explain the elements of procedural performance and radiation protection.
6. Recognize the requirements for clinical competency.

Course Number and Course Name: **RGT 253(2-4) Radiographic Procedures III**

Description: This course includes principles and procedures involved in radiographic positioning of the entire cranium and facial bones. Included is a review of radiographic anatomy on each procedure. This course is a continuation of Radiographic Procedures I and II.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
2	1	2	45
3	2	2	60
4	3	2	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Identify positioning considerations for routine skull procedures.
   a. Describe routine views of the skull in terms of structure(s) visualized including general and positioning considerations involved.
   b. Perform the routine views of the skull in a laboratory environment.
   c. Evaluate radiographs of the skull in terms of positioning accuracy and image quality.
2. Identify procedural considerations for special views of the face and cranium.
   a. Describe routine and special views of the cranium and specific structures within the cranium and facial bones in terms of structure(s) visualized and function(s) demonstrated including general and positioning considerations.
   b. Explain the structure(s) visualized and function(s) demonstrated including general and positioning considerations involved in routine and special views of the cranium and specific structures within the cranium and facial bones, given clinical simulations.
   c. In a laboratory environment, perform radiographic procedures of the skeletal system relating to the cranium and specific structures within the cranium and facial bones.
   d. Evaluate radiographs of various parts of the cranium and structures within the cranium, and evaluate facial bones in terms of positioning accuracy and image quality.
   e. Evaluate cranial cross-sectional anatomy.
3. Identify General Radiographic and Patient Considerations.
   a. Evaluate radiographic orders.
      (1) Two means of patient identifiers
      (2) Verification of procedures ordered
      (3) Obtain clinical history and assess the patient
      (4) Sequence exams properly
   b. Demonstrate proper room preparation.
   c. Establish patient rapport.
   d. Demonstrate proper patient:
      (1) Preparation
      (2) Assistance
      (3) Monitoring
      (4) Discharge

ASRT – Image Analysis

1. List image appearance standards.
2. Justify the need for imaging standards.
3. Explain technical, procedural, and clinical factors affecting image appearance.
4. Recognize patient-related and equipment-related artifacts.
5. Describe corrective actions that can be taken to improve image appearance.

ASRT - Radiographic Procedures

1. Discuss radiographic technique using anatomic, positioning, and projection terminology.
2. Evaluate radiographic orders and preparation for procedures.
3. Describe patient communication techniques and planning.
4. Apply patient positioning techniques for common exams.
5. Conduct contrast studies, including patient preparation and positioning.
6. Recognize special concerns and techniques for mobile and surgical radiography.

Course Number and Course Name: **RGT 2542 Radiographic Procedures IV**

Description: This course includes terminology, principles, and procedures involved in special radiographic positioning for demonstration of radiographic procedures at the current programmatic level. Included is a review of radiographic anatomy on each procedure. This is a continuation of Radiographic Procedures I, II and III.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
2	2	0	30
3	2	2	60
4	3	2	75

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Identify procedural considerations for special routine radiographic studies.
   a. Describe routine and special views of arthrography in regard to structure and positioning considerations.
   b. Describe routine and special views of myleography in regard to structure and positioning considerations.
   c. Describe routine and special views of venography in regard to structure and positioning considerations.
2. Identify procedural considerations for special radiographic studies.
   a. Explain the structure(s) visualized and function(s) demonstrated including general and positioning considerations involved for routine and special views of the soft tissue structures of the joints given clinical simulations.
   b. Evaluate radiographs of the various parts of the soft tissue structures of the joints in terms of positioning accuracy and image quality.
   c. Discuss imaging and other equipment used in various special studies.
   d. Describe special studies performed on various parts including bone survey, long bone measurement, and bone age.
   e. Describe the contrast medium utilized for each study in terms of type, administration method, and quantity when given various special studies.
   f. Describe the patient preparation for various special studies.
3. Identify various types of drugs and interactions.
   a. Distinguish between the chemical, generic, and trade names for select drugs.
   b. Describe pharmacokinetic and pharmacodynamic principles of drugs.
   c. Classify drugs according to specific categories.
   d. Explain the action uses and side effects for select drugs.
   e. Explain the effects of select drugs on imaging procedures.
   f. Describe methods and techniques for the administration of various types of contrast agents.
   g. Identify and describe the routes of drug administration.
   h. Discuss the purposes and advantages of intravenous drug administration over other routes.
   i. Differentiate between the two major sites of intravenous drug administration.
   j. Identify, describe, and document complications associated with intravenous drug therapy and appropriate actions to resolve these complications.
   k. Discuss the various elements of initiating and discontinuing intravenous drug therapy.
   l. Differentiate between and document dose calculations for adult and pediatric patients.
   m. Prepare contrast agents and intravenous medications for injection, utilizing aseptic technique.
4. Identify and describe diagnostic contrast agents.
   a. Define the categories of contrast agents, and give specific examples for each category.
   b. Explain the pharmacology of barium and iodine compounds.
5. Identify procedural considerations for the reproductive system.
   a. Describe routine and special views of the reproductive system in terms of structure(s) visualized and function(s) demonstrated including general and positioning considerations.
   b. Explain the structure(s) visualized and function(s) demonstrated including general and positioning considerations involved using clinical simulations.

c. In a laboratory environment, perform radiographic procedures related to the reproductive system.
d. Evaluate radiographs of various parts of the reproductive system in terms of positioning accuracy and image quality.

6. Identify General Radiographic and Patient Considerations.
   a. Evaluate radiographic orders.
      (1) Two means of patient identifiers
      (2) Verification of procedures ordered
      (3) Obtain clinical history and assess the patient
      (4) Sequence exams properly
   b. Demonstrate proper room preparation.
   c. Establish patient rapport.
   d. Demonstrate proper patient:
      (1) Preparation
      (2) Assistance
      (3) Monitoring
      (4) Discharge

ASRT – Image Analysis

1. List image appearance standards.
2. Justify the need for imaging standards.
3. Explain technical, procedural, and clinical factors affecting image appearance.
4. Recognize patient-related and equipment-related artifacts.
5. Describe corrective actions that can be taken to improve image appearance.

ASRT - Radiographic Procedures

1. Discuss radiographic technique using anatomic, positioning, and projection terminology.
2. Evaluate radiographic orders and preparation for procedures.
3. Describe patient communication techniques and planning.
4. Apply patient positioning techniques for common exams.
5. Conduct contrast studies, including patient preparation and positioning.
6. Recognize special concerns and techniques for mobile and surgical radiography.

Course Number and Course Name: **RGT 2911 Radiation Biology**

Description: This course is a study of the biological effects of radiation upon living matter. It includes genetic and somatic effects.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1	1	0	15
2	2	0	30

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe basic cellular biology and the molecular effects of ionizing radiation.
   a. Identify sources of electromagnetic and particulate ionizing radiations.
   b. Discuss direct or indirect effects of ionizing radiations.
   c. Identify sources of radiation exposure.
   d. Describe radiation induced chemical reactions, and analyze biologic damage.
   e. Identify methods to measure radiation response.
   f. Describe physical, chemical, and biologic factors influencing radiation response of cells and tissues.
   g. Explain factors influencing radiosensitivity.
   h. Recognize the clinical significance of lethal dose.
2. Explain variations in cell radiosensitivity and response.
   a. Examine effects of limited versus total body exposure.
   b. Relate short-term and long-term effects as a consequence of high and low radiation doses.
   c. Differentiate between somatic and genetic radiation effects as well as discuss specific diseases or syndromes associated with them.
   d. Discuss stochastic and non-stochastic (deterministic) effects.
   e. Discuss risk estimates for radiation-induced malignancies.
   f. Employ dose response curves to study the relationship between radiation dose levels and the degree of biologic response.
   g. Discuss use of and information to be gained from various dose/response curves.
   h. Discuss factors affecting radiation patient dose, such as ESE, bone marrow, and gonadal dose.

ASRT – Radiation Biology and Health Physics

1. Describe basic cellular biology and the molecular effects of ionizing radiation.
2. Explain variations in cell radiosensitivity and response.

Course Number and Course Name: **RGT 2922 Radiographic Pathology**

Description: This course is designed to introduce theories of disease causation and the pathophysiologic disorders that compromise healthy systems. Etiology, pathophysiologic responses, clinical manifestations, radiographic appearance, and management of alterations in body systems will be presented.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1	1	0	15
2	2	0	30

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Identify terms and conditions related to pathology.
   a. Define terms related to pathology.
   b. Discuss manifestations of pathological conditions and their relevance to radiographic procedures.
   c. Discuss complications connected with the repair and replacement.
2. Relate radiographic diagnosis to the classification of trauma and physical injury.
   a. Discuss the classifications of trauma.
   b. Describe examples and sites, complications, and prognosis for classifications of trauma.
   c. Describe radiologic procedures used in the diagnosis for trauma.
3. Explain classification and radiographic demonstration of systemic disease.
   a. Identify the systemic classifications of disease, and define them.
   b. Describe the various systemic classifications of disease in terms of etiology, types, common sites, complications, and prognosis.
   c. Discuss the radiographic appearance of selected diseases.

ASRT – Radiographic Pathology

1. Define common terms related to pathology.
2. Describe the causes of disease.
3. Explain radiologic pathology, including body systems, complications, and procedural considerations.
4. Discuss the relevance of pathology to radiographic procedures.

Course Number and Course Name: **RGT 2933 Certification Fundamentals**

Description: This course is designed to correlate scientific components of radiography to entry-level knowledge required by the profession.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
2	2	0	30
3	3	0	45
3	2	2	60
4	2	4	90
4	4	0	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Recall radiation protection standards.
   a. Explain the principals for radiation physics to included production interaction and the x-ray beam.
   b. Identify the biological effects of radiation.
   c. Discuss and utilize Radiation Protection to include exposure factors, beam restriction patient and personal protection.
2. Correlate Image Production.
   a. Differentiate Image acquisition and evaluation.
      (1) Critique the factors used in the selection of technical factors.
      (2) Evaluate recorded detail, distortion, density, and contrast in image production.
      (3) Analyze radiographic images, image acquisition, and quality of radiographs.
   b. Illustrate Equipment Operation and Quality Assurance.
      (1) Describe Image equipment process and display.
      (2) Critique quality control factors.
      (3) Describe the operation of imaging equipment.
3. Summarize the routine radiographic procedures.
   a. Identify the general procedural considerations.
   b. Identify the positioning, anatomy, physiology, and pathology for each of the specific imaging procedure categories:
      (1) Thorax
      (2) Abdomen and GI series
      (3) Urological studies
      (4) Extremities
      (5) Spine and pelvis
      (6) Head and neck
      (7) Other
4. Identify all aspects of patient care to include:
   a. Patient care interactions
   b. Ethical and legal
   c. Interpersonal communication
   d. Ergonomic and monitoring
   e. Medical emergency
   f. Infection control
   g. Handling and disposal of toxic materials
   h. Pharmacology

Elective Course Descriptions

Course Number and Course Name: **RGT 1111** **Radiologic Seminar I**

Description: This course is designed for students to participate in activities of various professional organizations such as the Radiologic Technology Student Organization, HOSA and other student activities. Leadership skills, an understanding of group dynamics, educational enrichment, stimulation of enthusiasm and interest, community service and rapport among health education professionals are outcomes of this course.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1	1	0	15

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Interaction and cooperation in the modern workplace.
   a. Demonstrate communication skills by actively participating in program and campus activities.
   b. Evaluate new materials added to the classroom.
2. Community participation.
   a. Actively participate in a class organized community service project.

Course Number and Course Name: **RGT 1121** **Radiologic Seminar II**

Description: This course is designed for students to participate in activities of various professional organizations such as the Radiologic Technology Student Organization, HOSA and other student activities. Leadership skills, an understanding of group dynamics, educational enrichment, stimulation of enthusiasm and interest, community service and rapport among health education professionals are outcomes of this course. One hour per week with additional activities to meet organizational goals. This is a continuation of Radiologic Seminar I.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1	1	0	15

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Interaction and cooperation in the modern workplace.
   a. Demonstrate problem-solving skills by actively participating in program and campus activities.
   b. Locate and utilize local resource sources.
2. Community participation.
   a. Actively participate in a class organized community service project.

Course Number and Course Name: **RGT 2111 Radiologic Seminar III**

Description: This course is designed for students to participate in activities of various professional organizations such as the Radiologic Technology Student Organization, HOSA and other student activities. Leadership skills, an understanding of group dynamics, educational enrichment, stimulation of enthusiasm and interest, community service and rapport among health education professionals are outcomes of this course. One hour per week with additional activities to meet organizational goals. This is a continuation of Radiologic Seminar I and II.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1	1	0	15

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Interaction and cooperation in the modern workplace.
   a. Demonstrate problem-solving skills by actively participating in program and campus activities.
   b. Locate and utilize local resource sources.
2. Community participation.
   a. Actively participate in a class organized community service project.

Course Number and Course Name: **RGT 211(3-4) Mammography**

Description: This course is designed to provide the professional community with a cognitive online base of entry-level education in the practice of Mammography.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45
4	4	0	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Identify and label anatomical structures of the breast, male and female.
2. Identify and label the breakdown of the single lobe.
3. Identify the three arterial branches supplying the breast and the three venous drainage channels.
4. Describe the lymphatic system and lymphatic drainage.
5. Correlate breast anatomical structures to mammographic anatomical structures.
6. Identify and label mammographic anatomical structures when presented with a mammographic image.
7. Discuss and understand the changes the breast undergoes due to hormonal influences during puberty, menses, pregnancy and the postmenopausal life cycles.
8. Describe the physiologic changes caused by estrogen, progesterone and prolactin.
9. Describe breast augmentation and identify the types of implants, common implant locations and the anatomical changes to the augmented breast.
10. Describe the anomalies of development that can occur in the breast.
11. Recognize clinical breast changes.
12. List the physical changes of the breast related to pathology.
13. List the mammographic changes of the breast related to pathology and, given mammographic images, identify the common mammographic appearance of breast pathology.
14. Identify risk factors limited to breast cancer.
15. State the recommendations for asymptomatic women regarding mammography.
16. Provide information on the importance of manual and visual breast self-examination.
17. Define treatment options for breast cancer.
18. Describe the generally accepted (postulated) progression of breast cancers from the ductal epithelium and nonepithelial tissues.
19. Describe changes seen after breast reduction surgery or following lumpectomy and surgical excision.
20. Identify current epidemiology and risk factors of breast cancer.
21. Describe elements of breast cancer screening protocols.
22. Demonstrate an understanding of breast anatomy and topographical orientation.
23. Detail a breast assessment.
24. Explain proper techniques and procedures for conducting a breast assessment.
25. Use nondiagnostic descriptors to record findings and document observations arising from the breast exam.
26. Participate in patient education regarding breast self-examination.
27. Discuss procedures to assist patients with special needs.
28. Explain patient services in the mammography department.
29. Discuss MQSA, American College of Radiology and Food and Drug Administration (FDA) guidelines and accreditations.
30. Label the components of the mammographic unit.
31. Demonstrate understanding of properly operated mammography equipment and demonstrate the understanding of correct use of compression devices, filtration devices, the magnification setup, use of grids and automatic exposure controls.
32. State the specifications of the various components in a mammography unit (half-value layer, focal spot size, source-to-image distance and the minimum requirements based on MQSA guidelines).
33. Define heel effect.

34. Define reciprocity law failure.
35. Differentiate between the various types of x-ray generators used in mammography.
36. Discuss and define digital mammography.
37. Explain the additional functions available with digital imaging – measuring the area of interest, filtration of image, magnification, contrast, density, subtraction of image.
38. Define compression, its usefulness and minimum and maximum requirements, based on MQSA guidelines.
39. State the purpose of magnification.
40. State the procedure used when magnifying breast tissue.
41. Accessorize equipment according to the procedure being performed.
42. Demonstrate the knowledge of setting appropriate kVp, mA and time or automatic exposure control (AEC) and the correct position of the photosensor.
43. Review film processing and reloading cassettes with mammography film.
44. Explain the process of producing hard copy images of digital images.
45. Describe standard needle lesion localization.
46. Describe stereotactic lesion localization.
47. Describe fine-needle aspiration biopsy.
48. Delineate Galactography.
49. Describe a stereotactic or core biopsy.
50. Describe the performance of quality control test procedures according to ACR and MQSA guidelines.
51. Outline safety checks on radiographic equipment and accessories.
52. Explain procedure and the need for compression to the patient before proceeding with the mammogram.
53. Achieve the best demonstration of breast tissue by manipulating the breast into proper placement, adjusting the patient, mammography equipment and cassettes, and placing the marker correctly.
54. Describe processing and evaluating the completed image.
55. Identify the qualities necessary for an acceptable mammogram.
56. Repeat films or additional views if necessary.
57. Be professional, competent, confident and nonjudgmental.
58. Describe how kVp, mA, time and compression affect the mammographic image and patient dose.
59. Identify the maximum permissible dose per mammography exam based on MQSA standards.
60. Identify the average dose per mammographic exposure.
61. Describe selecting the correct technical variable based on variations in breast anatomy.
62. Identify processing and imaging artifacts on mammography film.
63. Describe different types of processing and their importance in the mammographic imaging chain.
64. Describe sonography's role in mammography.

ASRT Additional Considerations

1. Differentiate the equipment used in mammographic imaging.
2. Discuss the dose differences between imaging and mammography doses.
3. Compare and contrast the various methods of image creation in mammography.
4. Explain the basic indications and contraindications for a mammographic study.
5. List the educational and certification requirements for mammography.
6. Discuss the image appearance and principles of operation for equipment used in mammography.

Course Number and Course Name: **RGT 212(1-2) Radiologic Seminar IV**

Description: This course is designed for students to participate in activities of various professional organizations such as the Radiologic Technology Student Organization, HOSA and other student activities. Leadership skills, an understanding of group dynamics, educational enrichment, stimulation of enthusiasm and interest, community service and rapport among health education professionals are outcomes of this course. One/two hour per week or equivalent with additional activities to meet organizational goals. This is a continuation of Radiologic Seminar I, II, and III.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
1	1	0	15
2	2	0	30

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Interaction and cooperation in the modern workplace.
   a. Demonstrate problem-solving skills by actively participating in program and campus activities.
   b. Locate and utilize local resource sources.
2. Community participation.
   a. Actively participate in a class organized community service project.

Course Number and Course Name: **RGT 212(3-4) Sectional Anatomy**

Description: This course is designed to study human sectional anatomy including location, structure, and function, as well as relationships among structures. Radiographs, Computed Tomography (CT) images, and Magnetic Resonance Imaging (MRI), Ultrasound and Positron Emission Tomography (PET) images may be used to demonstrate the characteristic appearance of anatomic structures.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45
4	4	0	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe the anatomy and physiology of the human body.
   a. Identify and describe the relationship of the structures to surrounding structures.
   b. Discuss the function of the structures of the human body.
   c. Identify Anatomical nomenclature.
2. Identify the structures and functions of the following anatomical regions as they appear in sectional illustrations:
   a. The head and brain
   b. The neck
   c. The chest and mediastinum
   d. The abdomen
   e. The pelvis
   f. The musculoskeletal system and spine
   g. The upper and lower extremities
3. Identify the structures of the following anatomical regions as they appear on CT, MR, and ultrasound images in the transverse axial, coronal, sagittal, and orthogonal (oblique) cross-sectional imaging planes:
   a. The head and brain
   b. The neck
   c. The chest and mediastinum
   d. The abdomen
   e. The pelvis
   f. The musculoskeletal system and spine
   g. The upper and lower extremities

ASRT- Sectional Anatomy

1. Locate major anatomical structures on CT, MR, and, ultrasound images in the transverse axial, coronal, sagittal, and orthogonal (oblique) cross-sectional imaging planes.
2. Explain the relationship of anatomical structures in the head and neck to surrounding structures.
3. Describe the function of the anatomical structures in the head and neck.
4. Explain the relationship of thoracic structures to surrounding structures.
5. Describe the function of anatomical structures located within the thorax.
6. Explain the relationship of anatomical structures in the abdomen and pelvis to surrounding structures.
7. Describe the function of anatomical structures located within the abdomen and pelvis.
8. Describe the function of anatomical structure located in the upper and lower extremities.

Course Number and Course Name: **RGT 2133 Computed Tomography**

Description: This course is designed to explore the technical principles of Computed Tomography (CT). A review of patient care, contrast media and adverse reactions, common CT procedures and protocols, image characteristics, and image quality control methods are taught.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe preparation, assessment, and monitoring of the patient for a CT procedure.
   a. Describe screening and consent procedures.
   b. Explain patient education.
   c. Discuss immobilization techniques.
   d. Summarize assessment and monitoring techniques, to include history, vital signs, lab values, and medications.
2. Discuss the use and administration of intravenous and oral contrast agents.
   a. Explain venipuncture and injection techniques in CT procedures.
   b. List types of contrast agent.
   c. Describe the route of administration.
   d. Perform dosage calculations.
   e. Identify special considerations in contrast administration.
   f. Discuss recognition, treatment, and documentation of adverse reactions.
3. Describe radiation safety measures in CT procedures.
   a. Discuss the CT technical factors affecting patient dose including dose modulation techniques.
   b. Discuss CTDI, MSAD, DLP and other methods of dose measurement.
   c. Discuss radiation protection guidelines for personnel, pediatric dose reduction, and adult patient dose reduction.
4. Identify correct acquisition methods and protocols for CT examination of the following anatomical regions of the body, to include modifications for pathology, trauma, and special procedures:
   a. The head and brain
   b. The neck
   c. The chest and mediastinum
   d. The abdomen
   e. The pelvis
   f. The musculoskeletal system and spine
   g. The upper and lower extremities
5. Discuss equipment operation and image processing.
   a. Describe the components of the CT unit.
   b. Describe image acquisition and attenuation.
   c. Discuss image processing and display, to include image reconstruction, display, postprocessing, and data management.
   d. Define the components of image quality.
   e. Explain artifact recognition and reduction.
6. Compare normal and abnormal structures in each of the following anatomical regions of the body:
   a. The head and brain
   b. The neck
   c. The chest and mediastinum
   d. The abdomen
   e. The pelvis
   f. The musculoskeletal system and spine
   g. The upper and lower extremities

ASRT - Basic Principles of Computed Tomography

- Describe the types and components of CT scanners.
- Describe the operations and processes by which CT scanners generate images.
- List the factors and postprocessing operations that affect image appearance.
- Apply radiation protection techniques specific to CT practice.

Course Number and Course Name: **RGT 214(3-4) Magnetic Resonance Imaging**

Description: This course provides a basic foundation of Magnetic Resonance Imaging (MRI). The physical and technical principles, imaging sequences, image artifacts, clinical applications, system components, and safety issues will be discussed. Images of sectional anatomy related to MRI will also be explored.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45
4	4	0	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe preparation, assessment, and monitoring of the patient for a MRI procedure.
   a. Describe screening and consent procedures.
   b. Explain patient education.
   c. Discuss immobilization techniques.
   d. Summarize assessment and monitoring techniques, to include history, vital signs, and medications.
2. Discuss safety and patient care considerations for MRI exams.
   a. Incorporate safety considerations when working in the MRI department.
   b. Describe patient care considerations for MRI exams.
3. Describe biological considerations for MRI procedures.
   a. Discuss radio frequency guidelines and effects.
   b. Discuss static field guidelines and effects.
   c. Discuss gradient field guidelines and effects.
4. Identify correct acquisition methods and protocols for MRI examination of the following anatomical regions of the body, to include modifications for pathology, trauma, and special procedures:
   a. The head and neck
   b. The spine
   c. The thorax
   d. The abdomen
   e. The pelvis
   f. The musculoskeletal system
5. Discuss data acquisition and image processing.
   a. Describe methods of pulse sequencing.
   b. Explain processes in data manipulation.
   c. Discuss special procedures.
   d. Explain how parameters and options affect image quality and contrast.
6. Discuss physical principles of image formation.
   a. Describe the instrumentation used for MRI imaging.
   b. Discuss the fundamental physical principles of image formation.
   c. Explain causes, appearances, and methods of compensation for artifacts.
   d. Discuss quality control measures for MRI imaging.
7. Compare normal and abnormal structures in each of the following anatomical regions of the body:
   a. The head and brain
   b. The neck
   c. The chest and mediastinum
   d. The abdomen
   e. The pelvis
   f. The musculoskeletal system and spine

Course Number and Course Name: **RGT 221(5-7) Mammography Clinical I**

Description: This course is designed from the ARRT's Mammography Clinical Experience Requirements and is designed to assist the radiographer obtain the specific eligibility requirements that must be documented as part of the application for certification and registration process for Mammography. The purpose of the clinical experience requirements is to verify that candidates have completed a subset of the clinical procedures within a discipline. Successful performance of these fundamental procedures, in combination with mastery of the knowledge and cognitive skills covered by the examination, provides the basis for the acquisition of the full range of clinical skills required in a variety of settings as required by the ARRT.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5	0	15	225
6	0	18	270
7	0	21	315

Prerequisite: RGT 2113 and ARRT registered

Student Learning Outcomes

1. Describe the type of x-ray equipment used in mammography.
2. Describe the imaging arrangements and techniques used in conventional mammography.
3. Describe the imaging principle.
4. Perform mammography studies utilizing conventional radiographic technique.
5. Identify artifacts and other technical flaws if present on the image.
6. Critique the radiograph in terms of diagnostic quality.
7. Perform patient handling tasks specific to mammography studies.
8. Provide radiation protection for patient and personnel.

Course Number and Course Name: **RGT 222(5-7) Mammography Clinical II**

Description: This course is designed from the ASRT and ARRT's Mammography Clinical Experience Requirements and is designed if the radiographer did not obtain the specific eligibility requirements from the previous Clinical Experience I and therefore Clinical Experience II must be documented as part of the application for certification and registration process for Mammography. The purpose of the clinical experience requirements is to verify that candidates have completed a subset of the clinical procedures within a discipline. Successful performance of these fundamental procedures, in combination with mastery of the knowledge and cognitive skills covered by the examination, provides the basis for the acquisition of the full range of clinical skills required in a variety of settings as required by the ARRT. This is a continuation of Mammography Clinical I.

Hour Breakdown:

Semester Credit Hours	Clinical	Lab	Contact Hours
5	15		225
6	18		270
7	21		315

Prerequisite: RGT 2113, RGT 221(5-7) and ARRT registered in Radiography

Student Learning Objectives:

1. Describe the type of x-ray equipment used in mammography.
2. Describe the imaging arrangements and techniques used in conventional mammography.
3. Describe the imaging principle.
4. Perform mammography studies utilizing conventional radiographic technique.
5. Identify artifacts and other technical flaws if present on the image.
6. Critique the radiograph in terms of diagnostic quality.
7. Perform patient handling tasks specific to mammography studies.
8. Provide radiation protection for patient and personnel.

Course Number and Course Name: **RGT 2233 CT Cardiac**

Description: This course is designed to teach students the anatomy and physiology of the heart, the steps needed to do a cardiac CT scan, and dose reduction methods for cardiac CT.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Discuss the anatomy and physiology of the heart Including:
    - A. Cardiac anatomy
        1. Chambers
        2. Coronary arteries
        3. Valves
    - B. Cardiac physiology
        1. Electrical conduction system
        2. ECG waveform
            a. Sinus rhythm
            b. Arrhythmias
    - C. Cardiac cycle
2. Understand the process of patient screening and preparation including:
    - A. Clinical history
    - B. Indications for exam protocol
    - C. Contraindications for exam
    - D. Preprocedural medications
        1. Beta blocker
        2. Nitroglycerin
    - E. Intravenous access requirements
    - F. Electrocardiogram (ECG)
        1. Lead configurations
        2. Skin prep and lead placement
        3. Artifacts
    - G. Breath holding training
    - H. Shielding

Course Number and Course Name: **RGT 2243 Physiology and Pathology Correlation in Computed Tomography**

Description: This course includes the study of body system functions associated with diseases that are represented by Computed Tomography.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Describe diseases and pathologies of the immune, cardiovascular, and central nervous systems and their CT appearance.
2. List diseases and pathologies of the hematopoietic, lymph, and respiratory systems and their CT appearance.
3. Explain diseases and pathologies of the gastrointestinal, genitourinary, and hepatobiliary systems and their CT appearance.
4. Discuss diseases and pathologies of the head and neck and musculoskeletal systems, and their CT appearance.
5. Recognize diseases and pathologies of the affecting pediatric patients, and their CT appearance.

Course Number and Course Name: **RGT 2253 CT Physics- Instrumentation in Computed Tomography**

Description: This course is designed to help students develop an understanding of the historical development of CT scanners. Students will also learn the components and operation of current CT scanners, unique CT applications, and digital imaging. A focus will also be placed on radiation safety related to CT.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Recall historical development of computed tomography.
    A. Definition and evolution of terms
    B. Research contributors to the development of CT
    C. Historical development of CT
2. Describe Computed Tomography generations.
    A. First generation
    B. Second generation
    C. Third generation
    D. Fourth generation
    E. Fifth/Sixth generations
    F. Spiral/helical CT
    G. Multi-slice CT
    H. Dual-source CT
3. Describe CT Scanner Components and Operations.
    A. CT x-ray tube
        1. Differences from a conventional x-ray tube
        2. Heating capacity
    B. CT filters
    C. Collimators
    D. Aperture size
    E. Gantry/table features
        1. Gantry tilt
        2. Table height
        3. Positioning lasers
        4. Weight limitations
        5. Table materials
    F. Detectors
        1. Types
        2. Detector arrays
    G. Data acquisition system (DAS)
    H. Consoles
        1. Workstation
        2. Processing/viewing station
    I. Tube heating monitors
    J. Archival methods
4. Explain digital imaging.
    A. Steps of image digitization
        1. Scanning
        2. Sampling
        3. Quantization
        4. Analog to digital conversion

5. Digital to analog conversion
B. Image characteristics
1. Resolution
2. Contrast
C. Scan projection radiography
D. Beam configuration
E. CT informatics
1. Picture archiving and communication systems (PACS)
2. Digital imaging and communications in medicine (DICOM)
3. Hospital information system (HIS)
4. Radiology information system (RIS)

5. Explain Computed Tomography Process.
A. Data acquisition
1. Methods
a. Axial/sequential
b. Helical/spiral
c. Volumetric
d. CT Fluoroscopy
2. Data acquisition system (DAS)
a. Components
1) Gantry
a) Tube
b) Generator
c) Slip Ring
d) Detectors
i. Solid state
ii. Dual layer
iii. Photon counting
e) Filters
f) Collimators
2) Analog-to-digital conversion (ADC)
a) Functions
1) Measurement of transmitted beam
2) Encoding measurements into binary data
3) Logarithmic conversion of data
4) Transmission of data to computer
3. Data acquisition process
a. Scanning/raw data/image data
1) Ray sums
2) Views
3) Profiles/image data
a) Pixels
b) Matrices
c) Voxels
4) Sampling
a) Angular
b) Ray
b. Attenuation
1) Lambert-Beer law
2) Linear attenuation coefficients
3) CT numbers/Hounsfield numbers
c. Selectable scan factors
1) Scan field of view (SFOV)
2) Display field of view (CFOV)

3) Matrix size/pixel size
4) Slice thickness
5) Window width
6) Window level
7) mA and kVp
8) Scan time and rotational arc
9) Kernel/filter algorithm
10) Radiographic tube output
11) Region of interest (ROI)
12) Magnification
13) Focal spot size and tube geometry
14) Pitch
15) Slice sensitivity profile (SSP)

B. Image reconstruction
1. CT computer
a. Minicomputer and microprocessors
b. Array processors
2. Reconstruction algorithms
a. Conventional CT
1) Back projection (historical only)
2) Filtered back projection
b. Iterative reconstruction
c. Single detector row spiral
1) Linear interpolation
d. Multidetector row spiral
1) Longitudinal interpolation with Z-axis filtering
2) Interlaced sampling
3) Fan-beam
4) Convolution/algorithm
5) Isotropic scanning
6) In plane resolution
e. 3-D

C. Image display, manipulation, recording and archiving
1. Image display
2. Display monitors
a. Active-matrix liquid crystal displays (AMLCD)
b. Cathode ray tube (CRT)
3. Computer console basic tools use
a. Pan
b. Zoom
c. Axial image scrolling
d. Swivel
e. Roll
f. Rotate
g. Inverse image
h. Workstation basic tools
1) Directory
2) Imaging
3) Report
4) Delete
5) Archive
6) Copy
7) Online help
i. Image station application tool

1) Cardiac
2) Neurology
3) Vascular
4) GI
5) Pulmonary
6) Dental
7) Orthopedics
8) Bone mineral density

j. Image viewing modes
1) 2-D
2) Slab
3) Planar
4) CT fluoroscopy

k. Magnify

4. Manipulation
a. Image reformation
1) Multiplanar reformation (MPR)
2) Curved multiplanar reconstruction (cMPR)
3) Retrospective reconstruction

b. Image smoothing
c. Edge enhancement
d. Gray-scale manipulation
e. 3-D processing
f. Shaded surface rendering (SR)/display (SSD)
g. Maximum intensity projection (MIP)
h. Minimum intensity projection (MinIP)
i. Volume rendering (VR)
1) Virtual endoscopy/colonoscopy (VE)
2) Vessel analysis (VA)
3) Vessel tracking (VT)

j. Radiation therapy treatment planning
k. Fusion
l. Segmentation

5. Viewing modes
a. 2-D
b. Slab
c. Planar

6. CT fluoroscopy
7. Recording and archiving
a. DICOM
b. PACS
c. Data storage

6. Develop an understanding of radiation protection practices for the CT patient.

A. Measuring patient radiation dose
1. Dosimetry methods
a. Thermoluminescent dosimeters (TLDs)
b. Pencil ionization chamber
c. CT dose measurement phantom

2. CT dose metrics
3. CT dose index (CTDI)
4. CT dose index volume (CTDIvol)
5. Multiple scan average dose (MSAD)
6. Dose length product (DLP) a. Effective dose
7. Size specific dose estimate (SSDE)

8. Effective dose
9. Dose reporting
    a. Millisievert (mSv)
    b. Milligray (mGy)

B. Reducing radiation dose
1. Methods
    a. Increased screening techniques
    b. Alternative diagnostic imaging
    c. Reduction in multi-phasic examinations
    d. technical factor selection
        1) mA
        2) kVp
        3) Collimation
        4) Couch speed
        5) Pitch
        6) Gantry rotation time
    e. Scanning geometry (partial rotation)
    f. Z-axis filtering
    g. Scanning mode
    h. Scanning length
    i. Scanner dosimetry survey
    j. Filtration
    k. Automatic tube current modulation
    l. Anatomical parameter consideration
        1) Weight of the patient
        2) Cross-sectional dimension of the patient
    m. Dual source/dual energy scanners
2. Shielding
    a. Bismuth shields
    b. Shield positioning
3. Dose Awareness Systems
    a. Dose notification
    b. Dose Alert
4. Dose reduction software
    a. Adaptive filtration
    b. Iterative reconstruction
    c. Dedicated pediatric protocols
5. Hardware design
    a. Off-focus radiation suppression (tube)
    b. Filtration – bowtie filters
    c. Collimation to prevent helical over-ranging or over-scanning
    d. Data acquisition system (DAS) – detector system efficiency

C. Pediatric patients
1. Image Gently
2. Radiation dose reduction parameters
    a. Weight categories (thorax and abdomen)
    b. Age categories (skull and brain)
    c. kVp and mA reduction

D. Ethical considerations in overuse of CT imaging
1. Need for education
2. Lack of awareness
3. Image Gently
4. Image Wisely
5. Pediatrics

Course Number and Course Name: **RGT 2263 Planar and Volumetric Postprocessing**

Description: This course is a study of image postprocessing, 2-D techniques in CT, 3-D imaging, display techniques in CT, image quality concerns, and CT artifacts.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Discuss image postprocessing including:
   - A. Definition and benefits
   - B. Data acquisition requirements
     1. 2-D generation
        - a. Axial
        - b. Coronal
        - c. Sagittal
        - d. Orthogonal (oblique)
     2. 3-D generation
        - a. Data acquisition, creation of 3-D space
          1) Coordinate systems to create 3-D (scene) space
             - a) Scanner coordinate system
             - b) Display coordinate system
             - c) Object coordinate system
             - d) Scene coordinate system
          2) 3-D space
             - a) Image space
             - b) Object space
             - c) Parameter space
             - d) View space
        - b. Postprocessing
   - C. Image display
2. Describe 3-D Imaging System.
   - A. Input – communication with configured DICOM devices to query and retrieve study
   - B. Workstation – identify proper series for postprocessing, manipulation and analysis
   - C. Output – exporting/recording DICOM images
3. Define 3-D terminology.
4. Describe 3-D Image Transformation.
   - A. Modeling
   - B. Shading and lighting
   - C. Rendering
5. Explain postprocessing techniques in 2-D and 3-D imaging.
   - A. Slice imaging
     1. MPR
        - a. Planes and image reformation (axial, coronal, sagittal, oblique)
        - b. Thickness of reformatted images/sliding thin slabs (STS)
     2. Intensity projection renderings
        - a. Average intensity projection (AIP or AVE)
        - b. Maximum intensity projection (MIP)
        - c. Minimum intensity projection (MinIP)
     3. Application of MPR and intensity projection renderings
        - a. Anatomically corrected datasets

b. Noise reduction
c. Improve spatial resolution

4. Curved multiplanar reformation (cMPR)
a. Visualization of tubular structures-straightened
b. Manual and automatic tracking
c. Application
1) Vessels
2) Ducts

B. Develop an understanding of projective imaging.

1. Surface rendering (SR) or shaded surface display (SSD)
a. Surface formation and rendering
b. Selection of threshold and size
c. Shading (shadowing effect)
d. Lighting (virtual light source)
e. Image rotation and viewing angle

2. SSD Applications
a. Visualization of complex 3-D relationships
b. Virtual endoscopy

3. Volume rendering (VR)
a. Preprocessing
b. Rendering or ray tracing
c. Opacity/transparency curve-surface display

4. VR Applications
a. CT angiography (CTA)
b. Skeletal images
c. Volume measurements
d. Articular surface viewing
e. Extremity images

C. Volume imaging

1. Virtual reality images – volume rendering with transparency
2. Virtual CT endoscopy (VE)
a. Perspective volume rendering (pVR) – rendering along a path
b. Alternative viewing angles
c. Applications
1) Angiography
2) Bronchoscopy
3) Colonoscopy
d. Cystoscopy

D. Segmentation

1. Threshold techniques
2. Automated techniques

6. Describe 3-D image display.

A. 2-D screen captures – proper window/level (W/L) display
B. Cine
C. Advanced 3-D display
1. Fusion (PET/CT)
2. Tissue perfusion (functional) imaging
3. Artificial intelligence (AI)
a. Computer -aided diagnosis (CAD)

7. Explain CT Measurements.

A. 2-D measurements
1. Angle
2. Centerline length
3. Area

4. Circumference
5. Diameter
6. Histogram
7. Profile
8. Calcium scoring

B. 3-D volume measurements

8. Image Quality

A. Acquisition errors

1. Source image errors

a. Slice thickness
b. Image overlap
c. Reconstruction algorithm
d. Timing

1) Bolus tracking
2) Delayed images

2. Positioning/technical errors

a. Segmentation
b. Curved planar centerline error
c. Volume rendering settings
d. Annotation errors
e. Improper 3-D imaging protocol

B. Improving image quality.

1. Protocol selection (injection, scan timing)
2. Patient motion
3. Image data manipulation

9. Understand 3-D artifacts.

A. CT artifacts in 3-D image postprocessing

1. Noise
2. Segmentation misrepresentation
3. Beam hardening
4. Motion
5. Patient size

B. Multiplanar reconstruction (MPR) and curved multiplanar reconstruction (cMPR) artifacts

1. Partial volume
2. False stenosis
3. Mirror artifacts (cMPR)

C. Maximum intensity projection (MIP) and minimum intensity projection (MinIP) artifacts

1. Depth perception
2. Superimposition of structures
3. Vessel calcification

D. Surface rendering (SR) and shaded surface display (SSD) artifacts

1. Raising threshold selection
2. Lowering threshold selection

E. Volume rendering (VR) artifacts

1. Venetian blind
2. Opacity setting error

Course Number and Course Name: **RGT 2273 Artificial Intelligence for Imaging**

Description: Students will learn about AI applications in healthcare, imaging, and CT scans. Students will study AI terminology and develop an understanding of the ethics involving AI in healthcare.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Define terminology and concepts.
    A. Algorithm
    B. Automation
    C. Artificial intelligence (AI)
        1. Artificial narrow intelligence
        2. Artificial general intelligence
        3. Artificial super intelligence
    D. AI-enabled
    E. AI-bias
    F. Machine learning (ML)
        1. Supervised
        2. Unsupervised
        3. Deep learning (DL)
    G. Neural network models
        1. Artificial neural networks (ANN)
        2. Convolutional neural networks (CNN)
        3. Recurrent neural networks (RNN)
    H. Software as a medical device (SaMD)
    I. Recursion
    J. Natural language processing (NLP)
        1. Pattern recognition
        2. Visual perception
        3. Decision making
2. Explain data and data sets
3. List AI applications in healthcare.
    A. Diagnosis and treatment recommendation
    B. Patient engagement
    C. Administrative activities
4. List AI applications in medical imaging.
    A. Order scheduling and patient screening
    B. Exam protocoling
    C. Image acquisition
    D. Image analysis
        1. Automated detection of findings
        2. Automated interpretation of findings
    E. Automated clinical decision support (CDS)
5. Recognize additional AI applications in CT.
    A. Deep learning image reconstruction
    B. Image segmentation
6. Recognize standards related to ethics, legality, and liability of AI in healthcare.

Course Number and Course Name: **RGT 228(5-7) CT Clinical I**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the ARRT (American Registry of Radiologic Technologists) Computed Tomography Registry exam. Areas included are patient care and management, radiation protection, operation of equipment, and Computed Tomography procedures.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5-7	0	15-21	225-315

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply computed tomography principles in the clinical setting regarding program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
   b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic X-ray production and interactions in relation to Computed Tomography.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application competency skills for a minimum of 15 computed tomography procedures. The clinical experience requirements for CT consist of 62 procedures in six distinct categories:
   A. Head, Spine, and Musculoskeletal
   B. Neck and Chest
   C. Abdomen and Pelvis
   D. Additional Procedures
   E. Image Display and Post Processing
   F. Quality Assurance
3. Demonstrate the following tasks associated with each of the computed tomography procedures.
   a. Abide by physician's orders and computed tomography requests.
   b. Verify patient identification.
   c. Prepare radiographic room.
   d. Manipulate computed tomography equipment.
   e. Demonstrate patient transport techniques.
   f. Identify accessory equipment.
   g. Produce Computed Tomography images.
   h. Follow line structure organization within departments and institutions.

i. Apply basic radiation protection.
j. Demonstrate effective communication skills.
k. Select technical factors and appropriate protocol parameters to produce quality diagnostic images with the lowest radiation exposure possible.
l. Critique images for appropriate anatomy, image quality and patient identification.
m. Determine corrective measures to improve inadequate images.

Course Number and Course Name: **RGT 229(5-7) CT Clinical II**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the ARRT (American Registry of Radiologic Technologists) Computed Tomography Registry exam. Areas included are patient care and management, radiation protection, operation of equipment, and Computed Tomography procedures. This is a continuation from CT Clinical I.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5-7	0	15-21	225-315

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply computed tomography principles in the clinical setting regarding program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
   b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic X-ray production and interactions in relation to Computed Tomography.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application competency skills for a minimum of 15 computed tomography procedures. The clinical experience requirements for CT consist of 62 procedures in six distinct categories:
   A. Head, Spine, and Musculoskeletal
   B. Neck and Chest
   C. Abdomen and Pelvis
   D. Additional Procedures
   E. Image Display and Post Processing
   F. Quality Assurance
3. Demonstrate the following tasks associated with each of the computed tomography procedures.
   a. Abide by physician's orders and computed tomography requests.
   b. Verify patient identification.
   c. Prepare radiographic room.
   d. Manipulate computed tomography equipment.
   e. Demonstrate patient transport techniques.
   f. Identify accessory equipment.
   g. Produce Computed Tomography images.
   h. Follow line structure organization within departments and institutions.
   i. Apply basic radiation protection.
   j. Demonstrate effective communication skills.

k. Select technical factors and appropriate protocol parameters to produce quality diagnostic images with the lowest radiation exposure possible.
l. Critique images for appropriate anatomy, image quality and patient identification.
m. Determine corrective measures to improve inadequate images.

Course Number and Course Name: **RGT 231(3-4) Cardiac Interventional Structural Basics**

Description: The purpose of Cardiac Interventional Structural Basics is to provide the advanced opportunity for radiologic technologist to develop mastery of discipline-specific knowledge to assist candidates with the requirements set forth by the American Registry of Radiologic Technologist (ARRT) and to become eligible in correlation with the procedural requirements for the ARRT in cardiac intervention

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45
4	4	0	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Differentiate the equipment used in cardiac interventional procedures.
2. Discuss the dose differences between imaging and cardiac interventional procedures.
3. Compare and contrast the various methods of image creation in cardiac interventional procedures.
4. Explain the basic indications and contraindications for cardiac interventional procedures.
5. List the educational and certification requirements for cardiac imaging.
6. Discuss the image appearance and principles of operation for equipment used in cardiac imaging.

Course Number and Course Name: **RGT 232(3-4) Vascular Interventional Structural Basics**

Description: The purpose of Vascular Interventional Structural Basics is to provide the advanced opportunity for radiologic technologist to develop mastery of discipline-specific knowledge to assist candidates with the requirements set forth by the American Registry of Radiologic Technologist (ARRT) and to become eligible in correlation with the procedural requirements for the ARRT in vascular intervention.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	3	0	45
4	4	0	60

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Differentiate the equipment used in cardiac interventional procedures.
2. Discuss the dose differences between imaging and cardiac interventional procedures.
3. Compare and contrast the various methods of image creation in cardiac interventional procedures.
4. Explain the basic indications and contraindications for cardiac interventional procedures.
5. List the educational and certification requirements for cardiac imaging.
6. Discuss the image appearance and principles of operation for equipment used in cardiac imaging.

Course Number and Course Name: **RGT 233(5-7) MRI Clinical I**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the American Registry of Radiologic Technologists (ARRT) Magnetic Resonance Imaging Registry exam.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5-7	0	15-21	225-315

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply magnetic resonance imaging principles in the clinical setting regarding program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
   b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic production of magnetic resonance imaging.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application competency skills for a minimum procedure. The clinical experience requirements for MRI consist of 47 procedures in six distinct categories:
   A. Head and Neck
   B. Spine
   C. Thorax
   D. Abdomen and Pelvis
   E. Musculoskeletal
   F. Additional Imaging Procedures
3. Demonstrate the following tasks associated with each of the MRI procedures.
   a. Abide by physician's orders and MRI requests.
   b. Verify patient identification.
   c. Prepare radiographic room.
   d. Manipulate MRI equipment.
   e. Demonstrate patient transport techniques.
   f. Identify accessory equipment.
   g. Produce Magnetic Resonance images.
   h. Follow line structure organization within departments and institutions.
   i. Apply patient safety.
   j. Demonstrate effective communication skills.
   k. Select factors and appropriate protocol parameters to produce quality images.
   l. Critique images for appropriate anatomy, image quality and patient identification.
   m. Determine corrective measures to improve inadequate images.

Course Number and Course Name: **RGT 234(5-7) MRI Clinical II**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the ARRT (American Registry of Radiologic Technologists) Magnetic Resonance Imaging Registry exam. This is a continuation from MRI Clinical I.

Hour Breakdown:

Semester Credit Hours	Lecture	Clinical	Contact Hours
5-7	0	15-21	225-315

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Apply magnetic resonance imaging principles in the clinical setting regarding program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
   b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic production of magnetic resonance imaging.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application competency skills for minimum procedures. The clinical experience requirements for MRI consist of 47 procedures in six distinct categories:
   A. Head and Neck
   B. Spine
   C. Thorax
   D. Abdomen and Pelvis
   E. Musculoskeletal
   F. Additional Imaging Procedures
3. Demonstrate the following tasks associated with each of the MRI procedures.
   a. Abide by physician's orders and MRI requests.
   b. Verify patient identification.
   c. Prepare radiographic room.
   d. Manipulate MRI equipment.
   e. Demonstrate patient transport techniques.
   f. Identify accessory equipment.
   g. Produce Magnetic Resonance images.
   h. Follow line structure organization within departments and institutions.
   i. Apply patient safety.
   j. Demonstrate effective communication skills.
   k. Select factors and appropriate protocol parameters to produce quality images.
   l. Critique images for appropriate anatomy, image quality and patient identification.
   m. Determine corrective measures to improve inadequate images

Course Number and Course Name: **RGT 235(5-7) Cardiac Interventional Clinical I**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the ARRT (American Registry of Radiologic Technologists) Vascular Interventional Radiography Registry exam.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5	0	15	225
6	0	18	270
7	0	21	315

Prerequisite: Instructor Approved and Basic Life Support (BLS) certification

Student Learning Outcomes:

1. Apply Cardiac Interventional Radiography principles in the clinical setting regarding program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
   b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic procedures of Cardiac Interventional Radiography.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application competency skills for minimum procedures. The clinical experience requirements for cardiac interventional radiography consist of 180 procedures reputations in listed distinct categories:
   - Left Heart Catheterization
   - Right Heart Catheterization
   - Coronary Interventional Procedures
   - Elective Procedures
3. Demonstrate the following tasks associated with each of the cardiac interventional radiography.
   a. Abide by physician's orders and Cardiac Interventional Radiography requests.
   b. Verify patient identification.
   c. Prepare radiographic room.
   d. Manipulate Cardiac Interventional Radiography equipment.
   e. Demonstrate patient transport techniques.
   f. Identify accessory equipment.
   g. Produce cardiac interventional radiography images.
   h. Follow line structure organization within departments and institutions.
   i. Apply patient safety.
   j. Demonstrate effective communication skills.
   k. Select factors and appropriate protocol parameters to produce quality images.
   l. Critique images for appropriate anatomy, image quality and patient identification.
   m. Determine corrective measures to improve inadequate images.

Course Number and Course Name: **RGT 236(5-7) Cardiac Interventional Clinical II**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the ARRT (American Registry of Radiologic Technologists) Vascular Interventional Radiography Registry exam. This is a continuation from Cardiac Interventional Radiography Clinical I.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5	0	15	225
6	0	18	270
7	0	21	315

Prerequisite: Cardiac Interventional Radiography Clinical Experience I
and Basic Life Support (BLS) certification

Student Learning Outcomes:

1. Apply Cardiac Interventional Radiography principles in the clinical setting regarding program levels.
    a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
    b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
    c. Provide patient and family education appropriate to comprehension level of the patient and family.
    d. Apply radiation protection principles.
    e. Discuss basic procedures of Cardiac Interventional Radiography.
    f. Operate medical imaging equipment and accessory devices.
    g. Position the patient and medical imaging system to perform examinations and procedures.
    h. Apply knowledge of human structure, function, and pathology.
    i. Evaluate the performance of medical imaging systems.
    j. Evaluate medical images for technical quality.
    k. Apply knowledge and skills relating to recording medical image processing.
    l. Operate equipment within safety limits.
    m. Recognize equipment malfunctions and report them to the proper authority.
    n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
    o. Demonstrate safe, ethical, and legal practices.
    p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
    q. Practice standard precautions at all times.
2. Perform clinical application competency skills for minimum procedures. The clinical experience requirements for cardiac interventional radiography consist of 180 procedures reputations in listed distinct categories:
    - Left Heart Catheterization
    - Right Heart Catheterization
    - Coronary Interventional Procedures
    - Elective Procedures
3. Demonstrate the following tasks associated with each of the cardiac interventional radiography.
    a. Abide by physician's orders and Cardiac Interventional Radiography requests.
    b. Verify patient identification.
    c. Prepare radiographic room.
    d. Manipulate Cardiac Interventional Radiography equipment.
    e. Demonstrate patient transport techniques.
    f. Identify accessory equipment.
    g. Produce cardiac interventional radiography images.
    h. Follow line structure organization within departments and institutions.

i. Apply patient safety.
j. Demonstrate effective communication skills.
k. Select factors and appropriate protocol parameters to produce quality images.
l. Critique images for appropriate anatomy, image quality and patient identification.
m. Determine corrective measures to improve inadequate images.

Course Number and Course Name: **RGT 237(5-7) Vascular Interventional Clinical I**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the ARRT (American Registry of Radiologic Technologists) Vascular Interventional Radiography Registry exam.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5-7	0	15-21	225-315

Prerequisite: Instructor Approved and Basic Life Support (BLS) certification

Student Learning Outcomes:

1. Apply Vascular Interventional Radiography principles in the clinical setting regarding program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
   b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic procedures of Vascular Interventional Radiography.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application competency skills for minimum procedures. The clinical experience requirements for Vascular interventional radiography consist of 180 procedures reputations in listed distinct categories:
   - Vascular Diagnostic (minimum 50)
   - Vascular Interventional (minimum 50)
   - Nonvascular (minimum 50)
3. Demonstrate the following tasks associated with each of the Vascular interventional radiography.
   a. Abide by physician's orders and Vascular Interventional Radiography requests.
   b. Verify patient identification.
   c. Prepare radiographic room.
   d. Manipulate Vascular Interventional Radiography equipment.
   e. Demonstrate patient transport techniques.
   f. Identify accessory equipment.
   g. Produce Vascular interventional radiography images.
   h. Follow line structure organization within departments and institutions.
   i. Apply patient safety.
   j. Demonstrate effective communication skills.
   k. Select factors and appropriate protocol parameters to produce quality images.
   l. Critique images for appropriate anatomy, image quality and patient identification.
   m. Determine corrective measures to improve inadequate images.

Course Number and Course Name: **RGT 238(5-7) Vascular Interventional Clinical II**

Description: This course includes clinical practice and instruction in a clinical affiliate and is designed to assist the technologist meet the minimum requirements to qualify to take the ARRT (American Registry of Radiologic Technologists) Vascular Interventional Radiography Registry exam. This is a continuation from Vascular Interventional Radiography Clinical II.

Hour Breakdown:

Semester Credit Hours	Lab	Clinical	Contact Hours
5-7	0	15-21	225-315

Prerequisite: Vascular Interventional Radiography Clinical Experience I and Basic Life Support (BLS) certification

Student Learning Outcomes:

1. Apply Vascular Interventional Radiography principles in the clinical setting regarding program levels.
   a. Demonstrate skills in assessment and evaluation of psychological and physical changes in the patient's condition and to carry out appropriate actions.
   b. Manage interaction with the patient and family in a way that provides desired psychosocial support.
   c. Provide patient and family education appropriate to comprehension level of the patient and family.
   d. Apply radiation protection principles.
   e. Discuss basic procedures of Vascular Interventional Radiography.
   f. Operate medical imaging equipment and accessory devices.
   g. Position the patient and medical imaging system to perform examinations and procedures.
   h. Apply knowledge of human structure, function, and pathology.
   i. Evaluate the performance of medical imaging systems.
   j. Evaluate medical images for technical quality.
   k. Apply knowledge and skills relating to recording medical image processing.
   l. Operate equipment within safety limits.
   m. Recognize equipment malfunctions and report them to the proper authority.
   n. Apply knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.
   o. Demonstrate safe, ethical, and legal practices.
   p. Abide by the profession's code of ethics and comply with the recognized scope of practice for the profession.
   q. Practice standard precautions at all times.
2. Perform clinical application competency skills for minimum procedures. The clinical experience requirements for Vascular interventional radiography consist of 180 procedures reputations in listed distinct categories:
   - Vascular Diagnostic (minimum 50)
   - Vascular Interventional (minimum 50)
   - Nonvascular (minimum 50)
4. Demonstrate the following tasks associated with each of the Vascular interventional radiography.
   a. Abide by physician's orders and Vascular Interventional Radiography requests.
   b. Verify patient identification.
   c. Prepare radiographic room.
   d. Manipulate Vascular Interventional Radiography equipment.
   e. Demonstrate patient transport techniques.
   f. Identify accessory equipment.
   g. Produce Vascular interventional radiography images.
   h. Follow line structure organization within departments and institutions.
   i. Apply patient safety.
   j. Demonstrate effective communication skills.
   k. Select factors and appropriate protocol parameters to produce quality images.
   l. Critique images for appropriate anatomy, image quality and patient identification.
   m. Determine corrective measures to improve inadequate images.

Appendix A: Recommended Tools and Equipment

CAPITALIZED ITEMS

1. Angulator (1 per 5 students)
2. Arm, blood pressure simulator (1 per 10 students)
3. Arm, injectable IV training simulator (1 per 10 students)
4. Image receptor holder, 30 cm by 35 cm (6 per lab)
5. Computer (1 per 2 students)
6. Computer workstation (1 per computer)
7. Grid cap 14 by 17 in. (1 per lab)
8. Grid cap 10 by 12 in. (1 per lab)
9. Holder, phantom head positioning (1 per 10 students)
10. Human sexless torso (1 per lab)
11. Interactive video equipment (1 per 5 students)
12. Intravenous continuous pump (1 per 10 students)
13. Laser printer (1 per 2 computers)
14. Lockable student storage (1 per student)
15. Patient care simulator (1 per program)
16. Patient restraint/Immobilizer/Positioner (1 per lab)
17. Patient transfer device adult positioner (1 per lab)
18. Phantom, sectional chest (1 per lab)
19. Phantom, sectional, elbow AP and 90 flexion (1 per lab)
20. Phantom, sectional, foot (1 per lab)
21. Phantom, sectional, hand PA: Lateral (1 per lab)
22. Phantom, sectional, head with cervical (1 per lab)
23. Phantom, sectional, knee AP and 90 flexion (1 per lab)
24. Phantom, sectional, pelvis (1 per lab)
25. Phantom patient, whole body with lungs (1 per lab)
26. Pneumonic compression paddle (1 per lab)
27. Stretcher (1 per lab)
28. Wheelchair with IV pole attachment (1 per lab)
29. X-ray radiography system (1 per 10 students)
30. X-ray radiography system, portable (1 per program)
31. Phantom, entire upper extremity (1 per lab)
32. Phantom, entire lower extremity (1 per lab)
33. Projector screen (1 per room)
34. Skeleton human bones, disarticulated (1 per room or 2 per program)
35. Skeleton, with stand, human adult (1 per room or 2 per program)
36. Supply storage cabinet, lockable (1 per program)
37. CR radiography system (1 per program)
38. DR radiography system (1 per program)
39. Resolution Grid
40. Pulse Oximeter

*Other equipment items may be added when deemed appropriate by the community college industry craft committee or by industry/business training requirements.

NON-CAPITALIZED ITEMS

1. Calipers (1 per lab)
2. Cassette holder, portable (1 per radiographic room)
3. Image Receptor, radiographic film holder 8 by10 in. (6 per program)
4. Image Receptor, radiographic film holder extremity 8 by 10 in. (6 per lab)
5. Image Receptor, radiographic film holder extremity 10 by 12 in. (6 per lab)
6. Image Receptor, radiographic film holders 14 by 17 in. (6 per lab)
7. Image Receptor, radiographic film holders 10 by 12 in. (6 per lab)
8. Cervical sandbags (1 set per lab)
9. Clock (1 per lab)
10. Gowns, cloth (1 per student)
11. Heart model (1 per 10 students)
12. IV Pole, on wheels (1 per lab)
13. Kidney model with base (1 per lab)
14. Lead apron (2 per lab)
15. Lead gloves (2 per lab)
16. Lead (flat shields) (3 per room)
17. Pillows (3 per lab)
18. Pillow cases (1 per pillow)
19. Positioning blocks, various sizes and shapes (1 per lab)
20. Portable AV security cabinet with electronic hookups (1 per program)
21. Skull, disarticulated (2 per program)
22. Sheets (2 per stretcher)
23. Sphygmomanometer with stethoscope (1 per 2 students)
24. Teaching Stethoscope
25. Stool, step (1 per lab)
26. Stool, adjustable (1 per lab)

It is recommended that instructors have access to the following items:

1. Television (1 per room)
2. ELMO presentation system (1 per program)
3. Projector, overhead (1 per room)
4. Table, mobile for portable overhead projector (desk type) (1 per program)
5. Electrical cart, steel, for AV equipment (1 per program)
6. Interactive whiteboard (1 per program)
7. iPads (1 per instructor)

Appendix B: Curriculum Definitions and Terms

Course Name – A common name that will be used by all community colleges in reporting students

Course Abbreviation – A common abbreviation that will be used by all community and junior colleges in reporting students

Classification – Courses may be classified as the following:

a. Career Certificate Required Course – A required course for all students completing a career certificate.
b. Technical Certificate Required Course – A required course for all students completing a technical certificate.
c. Technical Elective – Elective courses that are available for colleges to offer to students.

Description – A short narrative that includes the major purpose(s) of the:

- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course
- Corequisites – A listing of courses that may be taken while enrolled in the course
- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:

Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district

Activities that develop a higher level of mastery on the existing competencies and suggested objectives Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised

Activities that include integration of academic and career–technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career–technical programs Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas.

Sequencing of the course within a program is left to the discretion of the local college. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework.
Revising or extending the student learning outcomes
Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

Appendix C: Course Crosswalk

Course Crosswalk
Radiologic Technology
CIP 51.0911 Radiologic Technology/Science-Radiographer

Note: Courses that have been added or changed in the 2024 curriculum are highlighted.

Previous			Current		
2014 MS Curriculum Framework			**2018 MS Curriculum Framework**		
Course Number	**Course Title**	**Hours**	**Course Number**	**Course Title**	**Hours**
RGT 1213	Fundamentals of Radiography	3	RGT 1213	Fundamentals of Radiography	3
RGT 1223	Patient Care and Radiography	4	RGT 1223	Patient Care and Radiography	4
RGT 1114	Clinical Education I	4	RGT 1114	Clinical Education I	4
RGT 1124	Clinical Education II	4	RGT 1124	Clinical Education II	4
RGT 113(5-9)	Clinical Education III	5-9	RGT 113(5-9)	Clinical Education III	5-9
RGT 1312	Principles of Radiation Protection	2	RGT 1312	Principles of Radiation Protection	2
RGT 1413	Imaging Principles	4	RGT 1323	Principles of Exposure and Image Production	3
RGT 1423	Digital Imaging	3	RGT 1333	Digital Image Acquisition and Display	3
RGT 1513	Radiographic Procedures I	3	RGT 1513	Radiographic Procedures I	3
RGT 1523	Radiographic Procedures II	3	RGT 1523	Radiographic Procedures II	3
RGT 1613	Physics of Imaging Equipment	3	RGT 1613	Physics of Imaging Equipment	3
RGT 2132	Ethical and Legal Responsibilities	2	RGT 2132	Ethical and Legal Responsibilities	2
RGT 2147	Clinical Education IV	7	RGT 2147	Clinical Education IV	7
RGT 2157	Clinical Education V	7	RGT 2157	Clinical Education V	7
RGT 2532	Radiographic Procedures III	2	RGT 2532	Radiographic Procedures III	2
RGT 2542	Radiographic Procedures IV	2	RGT 2542	Radiographic Procedures IV	2
RGT 2911	Radiation Biology	1	RGT 2911	Radiation Biology	1
RGT 2922	Radiographic Pathology	2	RGT 2922	Radiographic Pathology	2
RGT 2933	Certification Fundamentals	3	RGT 2933	Certification Fundamentals	3

Course Crosswalk

Radiologic Technology

CIP 51.0911 Radiologic Technology/Science-Radiographer

Note: Courses that have been added or changed in the 2024 curriculum are highlighted.

Revised					
2024 MS Curriculum Framework					
Course Number	**Course Title**	**Hours**			
RGT 1111	Radiologic Seminar I	1			
RGT 111(3-5)	Clinical Education I	3-5			
RGT 1121	Radiologic Seminar II	1			
RGT 112(3-5)	Clinical Education II	3-5			
RGT 113(5-9)	Clinical Education III	5-9			
RGT 121(2-3)	Fundamentals of Radiography	2-3			
RGT 122(2-3)	Patient Care and Radiography	2-3			
RGT 1312	Radiation Protection	2			
RGT 132(3-4)	Image Production	3-4			
RGT 1333	Digital Imaging Analysis	3			
RGT 151(3-4)	Radiographic Procedures I	3-4			
RGT 1523	Radiographic Procedures II	3			
RGT 1613	Physics of Imaging Equipment	3			
RGT 2111	Radiologic Seminar III	1			
RGT 211(3-4)	Mammography	3-4			
RGT 212(1-2)	Radiologic Seminar IV	1-2			
RGT 2123	Sectional Anatomy	3			
RGT 2132	Ethical and Legal Responsibilities	2			
RGT 2133	Computed Tomography	3			
RGT 214(3-4)	Magnetic Resonance Imaging	3-4			
RGT 214(6-7)	Clinical Education IV	6-7			
RGT 215(6-7)	Clinical Education V	6-7			
RGT 253(2-4)	Radiographic Procedures III	2-4			
RGT 2542	Radiographic Procedures IV	2			
RGT 2911	Radiation Biology	1			
RGT 2922	Radiographic Pathology	2			
RGT 2933	Certification Fundamentals	3			
RGT 221(5-7)	Mammography Clinical I	5-7			
RGT 222(5-7)	Mammography Clinical II	5-7			
RGT 2233	CT Cardiac	3			
RGT 2243	Physiology and Pathology Correlation in Computed Tomography	3			
RGT 2253	CT Physics- Instrumentation in Computed Tomography	3			
RGT 2263	Planar and Volumetric Postprocessing	3			
RGT 2273	Artificial Intelligence for Imaging	3			
RGT 228(5-7)	CT Clinical I	5-7			
RGT 229(5-7)	CT Clinical II	5-7			
RGT 231(3-4)	Cardiac Interventional Structural Basics	3-4			
RGT 232(3-4)	Vascular Interventional Structural Basics	3-4			
RGT 233(5-7)	MRI Clinical I	5-7			
RGT 234(5-7)	MRI Clinical II	5-7			
RGT 235(5-7)	Cardiac Interventional Radiography Clinical I	5-7			

RGT 236(5-7)	Cardiac Interventional Radiography Clinical II	5-7			
RGT 237(5-7)	Vascular Interventional Radiography Clinical I	5-7			
RGT 238(5-7)	Vascular Interventional Radiography Clinical II	5-7			

Appendix D: Recommended Textbook List

Recommended Textbook List CIP 51.0911 Radiologic Technology/Science-Radiographer		
Book Title	**Author(s)**	**ISBN**
Introduction to Radiologic Technology 8th Ed.	Gurley | Calloway	978-0-3230-7351-6
Introduction to Radiologic & Imaging Sciences & Patient Care 8th Ed.	Adler |Carlton| Stewart	978-0-3238-7220-1
Bontrager Handbook Rad. Positioning/Tech. 9th Ed.	Lampignano | Kendrick	978-0-3233-9966-1
Comprehensive Radiographic Pathology 8th Ed.	Eisenberg	978-0-4431-2114-2
Digital Radiography & PACS 4th Ed.	Carter & Veale	978-0-3238-2698-3
Merrill's Atlas Radiographic Positioning Procedures. (3 vol.) 15th Ed.	Long, Rollins & Curtis	978-0-3238-3279-3
Merrill's Pocket Guide to Radiography 15th Ed.	Rollins	978-0-3238-3283-0
Radiation Protection in Medical Radiography 9th Ed.	Statkiewicz & Ritenour	978-0-3238-2503-0
Radiation Protection in Medical Radiography 9th Ed. Workbook	Sherer |Visconti| Haynes	978-0-3238-2508-5
Workbook Atlas Radiographic Positioning & Procedures 14th Ed.	Long, Rollins & Smith	978-0-3235-9704-3
Workbook for Merrill's Atlas of Radiographic Positioning and Procedures 15th Ed	Rollins, Long & Curtis	978-0-3238-3284-7
Workbook Radiographic Image Analysis 6th Ed.	Martensen	978-0-3239-3068-0
Principles of Radiographic Imaging 6th Ed.	Carlton | Adler	978-1-3377-1106-7
Radiography Prep 10th Ed.	Saia	978-1-2646-9253-8
Mosby's Comprehensive Review of Radiography 8th Ed.	Calloway	978-0-3236-9488-9
Basic Medical Techniques and Patient Care in Imaging Technology 8th Ed.	Torres	978-1-4511-1565-9
Radiographic Pathology for Technologists 8th Ed.	Kowalczyk	978-0-3237-9129-8
Ethical Dimensions in the Health Professions	Doherty | Purtilo	978-0-3233-2892-0
Rad Science for Technologists 12th Ed.	Bushong	978-0-3236-6134-8
Ethical and Legal Issues for Imaging Professionals 5th Ed.	Elsevier	978-0-3238-2750-8
Legal and Ethical Issues for Health Professions 4th Ed.	Nguyen	978-0-323-49641-4
Radiographic Imaging and Exposure 6th Ed.	Fauber	978-0-3236-6139-3
Fundamentals of Special Radiographic Procedures	Snopek	978-0-7216-0632-3
Torres' Patient Care in Imaging Technology 10th Ed.	Ryan	978-1-9751-9251-8
Essentials of Radiographic Physics and Imaging 3rd Ed.	Johnston | Fauber	978-0-3235-6668-1
Patient Care in Radiography 10th Ed	Ehrlich | Coakes	978-0-3236-5440-1
Workbook for Comprehensive Radiographic Pathology, 8th Ed.	Ronald | Nancy	978-0-3235-7087-9
Exploring Medical Terminology 11th Ed.	Brooks	978-0-3237-5757-7
Radiologic Science for Technologists 12th Edition	Bushong	978-0-3236-6134-8
Radiologic Science for Technologists 12th Edition Workbook	Bushong	978-0-3237-0973-6

*Or most recent edition.