**Cluster: Health Science**

**Pathway: Diagnostic**

**State Program Name: Radiologic Technology**

**OCAS Code: 9338 Radiologic Technology**

**CIP Code: 51.0911 Registered Technologist--Radiography**

**SOC Code: 29-3034.00 Radiologic Technology/Science-- Radiographer**

**Approved Assessments:**

 **8302 Registered Technologist--Radiography**

**Description**

Students in this program will learn how to perform imaging procedures using radiation. They will learn about imaging procedure and learn problem-solving techniques for image evaluation, and factors that can affect image quality. They will also learn how to work a variety of radiographic equipment and how to protect themselves and patients. In addition, students will also learn about patient care and how to handle routine and emergency patient care along with ethics, techniques of venipuncture and how to administer diagnostic contrast agents. Clinicals are also included in this major. Students will need to obtain certification from the American Registry of Radiologic Technologist (ARRT) in order to practice.

**Total Hours Original Framework: 2535.0 REVISED 2503.0**

**Total Hour Recommended: 2300**.**0**

**Prerequisites:**

**Minimum of 15 hours left towards Associates degree, any field of study from an Accredited college or University, recognized by ARRT.**

**Rad Techs Requirements in Oklahoma**

**Licensed: Pending Legislation 2017**

**Registered /Certified through ARRT, RT(R)**

**Degree required to take certification exam**

<https://www.asrt.org/docs/default-source/educators/curriculum/radiography/acad_curr_radcurrfinal2017_20170206.pdf?sfvrsn=2>

**Original Framework Courses**

|  |  |  |  |
| --- | --- | --- | --- |
| **Hours** |  | **Course Title** |  |
| 93.00 |  | Introduction to Radiologic Sciences and Health Care |  |
| 32.00 |  | Ethics and Law in the Radiologic Sciences |  |
| 96.00 |  | Human Structure and Function  |  |
| 48.00 |  | Image Analysis I |  |
| 60.00 |  | Principles of Imaging |  |
| 48.00 |  | Image Analysis II |  |
| 72.00 |  | Imaging Equipment |  |
| 64.00 |  | Digital Image Acquisition and Display |  |
| 64.00 |  | Patient Care in Radiologic Sciences |  |
| 32.00 |  | Pharmacology and Venipuncture |  |
| 645.00 |  | Clinical Practice I |  |
| 645.00 |  | Clinical Practice II |  |
| 32.00 |  | Introduction to Computed Tomography (optional) |  |
| 48.00 |  | Radiation Biology |  |
| 48.00 |  | Radiation Production and Characteristics |  |
| 48.00 |  | Radiation Protection |  |
| 150.00 |  | Radiographic Procedures I |  |
| 32.00 |  | Radiographic Pathology |  |
| 150.00 |  | Radiographic Procedures II |  |
| 16.00 |  | Career Preparation for Radiography |  |
| 64.00 |  | Comprehensive Program Review for Radiography |  |
| 48.00 |  | Advanced Imaging |  |
|  |  |  |  |

**Offered at:**

|  |  |  |  |
| --- | --- | --- | --- |
| **District** | **Campus** | **Local Name** |  |
| Autry Technology Center | Enid | Radiologic Technologist |  |
| Great Plains Technology Center | Lawton | Radiologic Technologist |  |
| Indian Capital Technology Center | Muskogee | Radiologic Technologist |  |
| Meridian Technology Center | Stillwater | Radiologic Technologist |  |
| Metro Technology Center | Springlake Campus | Radiologic Technologist |  |
| Tulsa Technology Center | Lemley | Radiologic Technologist |  |

**Course Outlines**

**Course Name:** Introduction to Radiologic Sciences and Health Care

**Course Hours:** 93

**Course Description:** The content below provides an overview of the foundations of radiography and the practitioner’s role in health care delivery. Principles, practices and policies of health care organizations should be examined and discussed in addition to the professional responsibilities of the radiographer.

**Course Objectives:**

* Identify health science professions that participate in the total health care of the patient.
* Identify various settings involved in the delivery of health care.
* Discuss the reimbursement/payment options for health care services.
* Discuss the role and value of a mission statement to the operation of a health care institution.
* Describe relationships and interdependencies of departments within a health care institution.
* Discuss the responsibilities and relationships of all personnel in the radiology department.
* Differentiate between accreditation types.
* Identify state and federal regulatory agencies.
* Define credentialing, national certification and registration and state licensure.
* Describe the types, purposes and functions of professional organizations.
* Discuss career opportunities and advancement for the radiographer.
* Identify the benefits of continuing education as related to improved patient care and

professional development.

* Apply the word-building process of medical terminology.
* Interpret medical abbreviations and symbols.
* Critique orders, requests and diagnostic reports.
* Define medical imaging and radiation oncology terms.
* Translate medical terms, abbreviations and symbols from medical

reports into layman’s terms.

**Recommended Resources:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Name:** Radiation Production and Characteristics**Course Hours:** 48**Course Description:** Content establishes a basic knowledge of atomic structure and terminology. Also presented are the nature and characteristics of radiation, x-ray production and the fundamentals of photon interactions with matter.**Course Objectives:*** Describe fundamental atomic structure.
* Explain the processes of ionization and excitation.
* Describe the electromagnetic spectrum.
* Describe wavelength and frequency and how they are related to velocity.
* Explain the relationship of energy, wavelength and frequency.
* Explain the wave-particle duality phenomena.
* Identify the properties of x-rays.
* Describe particulate radiation.
* Differentiate between ionizing and nonionizing radiation.
* Describe radioactivity and radioactive decay in terms of alpha, beta and gamma emission.
* Compare the production of bremsstrahlung and characteristic radiations.
* Describe the conditions necessary to produce x-radiation.
* Describe the x-ray emission spectrum.
* Explain the factors that affect the x-ray emission spectrum.
* Discuss various photon interactions with matter.
* Discuss relationships of wavelength and frequency to beam characteristics.
* Discuss the clinical significance of the photoelectric and modified scattering (Compton)

interactions in diagnostic imaging.**Recommended Resources:** |  |  |  |
| **Course Name:** Principles of Exposure and Image Production**Course Hours:** 60**Course Description:** Content establishes a knowledge base in technical factors that govern the image production process.**Course Objectives:*** Discuss practical considerations in setting standards for acceptable image quality.
* Assess radiographic exposure on radiographic images.
* Analyze the relationships of factors that control and affect image exposure.
* Critique the radiographic contrast within various radiographic images.
* Analyze the relationship of factors that control and affect radiographic contrast.
* Critique spatial resolution on various radiographic images.
* Analyze the relationships of factors that control and affect spatial resolution.
* Differentiate between size and shape distortion.
* Perform calculations to determine image magnification and percent magnification.
* Summarize the relationship of factors that control and affect distortion.
* Explain the rationale for using beam restriction.
* Describe the operation and applications for different types of beam restriction.
* Explain how beam filtration affects x-ray beam intensity, beam quality and patient exposure.
* Describe the change in the half-value layer (HVL) when filtration is added or removed.
* Summarize the relationship of factors affecting scattered radiation.
* Evaluate the effects of scattered radiation on the image.
* Compare grid types.
* Select the most appropriate grid for a given clinical situation.
* Interpret grid efficiency in terms of grid ratio and frequency.
* Summarize the factors that influence grid cutoff.
* Evaluate grid artifacts.
* Explain the use of standardized radiographic technique charts.
* Explain exposure factor considerations involved in selecting techniques.
* Compare fixed kilovoltage peak (kVp) and variable kVp systems.
* Apply the reciprocity law to clinical situations.
* Apply conversion factors for changes in the following areas: distance, grid, image receptors, reciprocity law and the 15 percent rule.

**Recommended Resources:****Course Name:** Digital Image Acquisition and Display**Course Hours:** 64**Course 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.**Special Note:** Digital imaging is a rapidly evolving technology. Every effort has been made to* provide a curriculum outline that reflects, as accurately as possible, the state of the art of this
* discipline as of publication. Educators are encouraged to modify this outline with up-to-date
* information as it becomes available from vendors, clinical sites, textbooks, and technical
* representatives.

**Course Objectives:*** Define terminology associated with digital imaging systems.
* Describe the various types of digital receptors.
* Describe the response of digital detectors to exposure variations.
* Compare the advantages and limits of each receptor type.
* Evaluate the spatial resolution of a digital imaging system.
* Define sampling frequency.
* Describe the Nyquist-Shannon theorem as it relates to sampling frequency.
* Describe the impact of sampling frequency on spatial resolution.
* Describe the impact of detector element size on spatial resolution.
* Describe detective quantum efficiency (DQE) for digital radiography detectors.
* Describe modulation transfer function (MTF) as it relates to digital radiography detectors.
* Describe the histogram and the process of histogram analysis as it relates to automatic

rescaling.* Describe the calculation of the exposure indicator (AAPM Task Group 116).
* Define region of interest (ROI).
* Relate the location and size of the ROI to the appearance of the image and exposure

indicator.* Relate how the values of interest (VOI) impact image appearance.
* Describe the process of image stitching.
* Relate the receptor exposure indicator values to technical factors, system calibration,

part/beam/plate alignment and patient exposure.* Describe the response of PSP systems to background and scatter radiation.
* Use appropriate means of scatter control.
* Avoid grid use errors associated with grid cutoff.
* Identify common limitations and technical problems encountered when using PSP systems.
* Employ appropriate beam/part/receptor alignment to avoid histogram analysis errors.
* Associate impact of image processing parameters to the image appearance.
* Apply the fundamental principles of radiographic exposure to digital detectors.
* Evaluate the effect of a given exposure change on histogram shape, data width and image

appearance.* Formulate a procedure or process to minimize histogram analysis and rescaling errors.
* Describe continuous quality improvement (CQI).
* Differentiate between quality assurance (QA) and quality control (QC).
* List the benefits of a quality control management to the patient and to the department.
* Examine 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.* Discuss the appropriate use of electronic masking.
* Describe picture archival and communications system (PACS) and its function.
* Identify components of a PACS.
* Define digital imaging and communications in medicine (DICOM).
* Identify critical components of the DICOM header.
* Describe HIPAA concerns with electronic information.
* Identify common problems associated with retrieving/viewing images within a PACS.
* Compare monitor types (e.g. acquisition, display).
* Describe the components of the various types of display monitors.
* Discuss the impact of viewing angle, luminance, ambient lighting, and pixel size on image

display.* Describe display monitor aspect ratio and its impact on image display.
 |  |  |  |
|  |  |  |  |
| **Recommended Resources:** |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| **Course Name:** Radiographic Procedures **Course Hours:** 300**Course Description:** Content provides the knowledge base necessary to perform standard imaging procedures and special studies. Consideration is given to the evaluation of optimal diagnostic images.**Course Objectives:*** Describe standard positioning terms.
* Demonstrate proper use of positioning aids.
* Discuss general procedural considerations for radiographic exams.
* Identify methods and barriers of communication and describe how each may be used or

overcome effectively during patient education.* Explain radiographic procedures to patients and family members.
* Modify directions to patients with various communication problems.
* Develop an awareness of cultural factors that necessitate adapting standard exam protocols.
* Adapt general procedural considerations to specific clinical settings.
* Identify the structures demonstrated on routine radiographic and fluoroscopic images.
* Adapt radiographic and fluoroscopic procedures for special considerations.
* Simulate radiographic and fluoroscopic procedures on a person or phantom in a laboratory

setting.* Evaluate images for positioning, centering, appropriate anatomy and overall image quality.
* Discuss equipment and supplies necessary to complete basic radiographic and fluoroscopic

procedures.* Explain the patient preparation necessary for various contrast and special studies.
* Explain the routine and special positions and projections for all radiographic and

fluoroscopic procedures.* Explain the purpose for using contrast media.
* Name the type, dosage and route of administration of contrast media commonly used to

perform radiographic contrast and special studies.* Describe the general purpose of radiographic and fluoroscopic studies.
* Apply general radiation safety and protection practices associated with radiographic and

fluoroscopic examinations.**Recommended Resources:** |  |  |  |
| **Course Name:** Radiographic Pathology**Course Hours:** 32**Course Description:** Content introduces concepts related to disease and etiological considerations with emphasis on radiographic appearance of disease and impact on exposure factor selection.**Course Objectives:*** Define basic terms related to pathology.
* Describe the basic manifestations of pathological conditions and their relevance to radiologic

procedures.* Discuss the classifications of trauma.
* Describe imaging procedures used in diagnosing disease.
* List the causes of tissue disruption.
* Describe the healing process.
* Identify complications connected with the repair and replacement of tissue.
* Describe the various systemic classifications of disease in terms of etiology, types, common

sites, complications and prognosis.* Describe the radiographic appearance of diseases.
* Identify imaging procedures and interventional techniques appropriate for diseases common

to each body system.* Identify diseases caused by or connected to genetic factors

**Recommended Resources:** |  |  |  |
|  |  |  |  |
|  |  |  |  |
| **Course Name:** Additional Modalities and Radiation Therapy**Course Hours:** **Course Description:** Content is designed to provide a brief overview of other imaging modalities and patient treatments.**Course Objectives:** * Recognize and compare basic equipment used in various imaging modalities and

radiation therapy.* Define basic terms related to dose differences.
* Compare and contrast different types of radiation.
* Explain basic terms related to patient preparations.
* Define basic terms related to indications and contraindications.
* Identify educational and certification requirements.
* Discuss the image appearance and basic principles of operation for equipment used in

various imaging modalities and radiation therapy.**Recommended Resources:** |  |  |  |
|  |  |  |  |
| **Course Name:** Career Preparation for Radiography**Course Hours:** 16**Course Description:** This course emphasizes communication skills and specific career knowledge for the health care professional. To support an occupational job search, a functional resume will be produced that summarizes the student's education, personal and professional achievements and work experience. To enhance their professional images, each student will construct cover letters and thank you notes that may be updated or changed as needed. Advanced career modality requirements and preparation will be investigated, as well as the requirements for professional continuing education and opportunities for life-long learning.Upon completion of this course, the student will be expected to:1. Communicate effectively using oral and written communication.2. Develop the tools utilized to secure employment.**Course Objectives:**1. Demonstrate the ability to communicate effectively using oral and written communications.2. Construct a functional resume, cover letter and thank-you note to aid in an occupational job search.3. Develop leadership skills through participation in Career Tech State Organization (CTSO), and/or community activities.4. State the continuing education requirements of the American Registry of Radiologic Technologists (ARRT)5. Discuss career opportunities in the field of radiologic sciences.6. Discuss opportunities for achieving life-long learning for radiographers.**Recommended Resources:****Course Name:** Comprehensive Program Review for Radiography**Course Hours:**  64**Course Description:** This course provides a comprehensive review of the radiography curriculum in preparation for taking the certification exam given by The American Registry of Radiologic Technologists (ARRT). Identified areas of weakness will help the student focus on the curriculum items that need concentrated study. The computerized testing format of the ARRT exam will be emphasized.Upon completion of the course the student will be expected to:1. Apply the knowledge gained from the program curriculum to successfully complete mock registry examinations.**Course Objectives:**1. Review the ARRT Examinee Handbook and become familiar with the examination guidelines.2. Apply the knowledge gained from each course in the program’s curriculum to complete assessment examinations in each category of the ARRT Examination Specifications.3. Analyze each examination taken for information that may require additional study or remediation.4. Develop a plan of review for areas of study that need remediation.5. Practice taking mock examinations using computer technology.6. Demonstrate competence by successfully completing mock examinations**Recommended Resources:** |  |  |  |
| **Course Name:** Advanced Imaging**Course Hours:** 48 |  |  |  |
| **Course Description:** This course emphasizes advanced skills and specific career knowledge for the health care professional. To broaden their knowledge of primary radiographic procedures, the student will be involved in the exploration of specialized diagnostic and/or therapeutic procedures that may include, but is not limited to, the study of advanced imaging procedures and related associated imaging modalities, analysis of radiographic/sectional images, and evaluation of ethical dilemmas. Flexibility is built into this course to provide a means for program faculty to develop the specialized knowledge and skills that may be required of students at their specific geographical location.Upon completion of this course the student will be expected to:1. Understand career opportunities and skills required in associated modalities.2. Discuss procedures performed in each modality.3. Discuss the technical components of each modality.**Course Objectives:**1. Discuss procedures performed in each modality.2. Relate the purpose of specialized equipment used during advanced procedures.3. Understand career opportunities and skills required in associated modalities.4. Analyze radiographic/sectional images produced in advance procedures.5. Evaluate ethical dilemmas and possible solutions within the scope of practice for radiographers.6. Demonstrate professional and accountable behavior for the radiographer.7. Discuss contrast and density influences on radiographic/sectional images.8. Discuss the technical components of each modality.9. Discuss the basic principles of operation of various imaging modalities and radiation therapy.**Recommended Resources:** |  |  |  |
|  |  |  |  |

**Course Name:** Clinical Practice II

**Course Hours:** 645

**Course Description:** Content and clinical practice experiences should be designed to sequentially develop, apply, critically analyze, integrate, synthesize and evaluate concepts and theories in the performance of radiologic procedures. Through structured, sequential, competency-based clinical assignments, concepts of team practice, patient-centered clinical practice and professional development are discussed, examined and evaluated.

**Course Objectives:**

* Exercise the priorities required in daily clinical practice.
* Execute medical imaging procedures under the appropriate level of supervision.
* Adhere to team practice concepts that focus on organizational theories, roles of team

members and conflict resolution.

* Adapt to changes and varying clinical situations.
* Describe the role of health care team members in responding/reacting to a local or national

emergency.

* Provide patient-centered, clinically effective care for all patients regardless of age, gender,

disability, special needs, ethnicity or culture.

* Integrate the use of appropriate and effective written, oral and nonverbal communication

with patients, the public and members of the health care team in the clinical setting.

* Integrate appropriate personal and professional values into clinical practice.
* Recognize the influence of professional values on patient care.
* Explain how a person’s cultural beliefs toward illness and health affect his or her health

status.

* Use patient and family education strategies appropriate to the comprehension level of the

patient/family.

* Provide desired psychosocial support to the patient and family.
* Demonstrate competent assessment skills through effective management of the patient’s

physical and mental status.

* Respond appropriately to medical emergencies.
* Examine demographic factors that influence patient compliance with medical care.
* Adapt procedures to meet age-specific, disease-specific and cultural needs of patients.
* Assess the patient and record clinical history.
* Demonstrate basic life support procedures.
* Use appropriate charting methods.
* Recognize life-threatening electrocardiogram (ECG) tracing.
* Apply standard and transmission-based precautions.
* Apply the appropriate medical asepsis and sterile technique.
* Demonstrate competency in the principles of radiation protection standards.
* Apply the principles of total quality management.
* Report equipment malfunctions.
* Examine procedure orders for accuracy and make corrective actions when applicable.
* Demonstrate safe, ethical and legal practices.
* Integrate the radiographer’s practice standards into clinical practice setting.
* Maintain patient confidentiality standards and meet HIPAA requirements.
* Demonstrate the principles of transferring, positioning and immobilizing patients.
* Comply with departmental and institutional response to emergencies, disasters and accidents.
* Differentiate between emergency and non-emergency procedures.
* Adhere to national, institutional and departmental standards, policies and procedures

regarding care of patients, providing radiologic procedures and reducing medical errors.

* Select technical factors to produce quality diagnostic images with the lowest radiation

exposure possible.

* Critique images for appropriate anatomy, image quality and patient identification.
* Determine corrective measures to improve inadequate images.

**Recommended Resources:**

**Course Name:** Patient Care in Radiologic Sciences

**Course Hours:**

**Course 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.

**Course Objectives:**

* Identify the responsibilities of the health care facility and members of the health care team.
* List the general responsibilities of the radiographer.
* Describe the practice standards for the radiographer as defined by the ASRT and state

licensure.

* Differentiate between culture and ethnicity.
* Explain how a person’s cultural beliefs toward illness and health affect his or her health

status.

* Explain perceptions of dying and death from the viewpoint of both patient and radiographer.
* Identify methods for determining the correct patient for a given procedure.
* Explain the use of various communication models.
* Explain specific aspects of a radiographic procedure to the patient.
* Demonstrate correct principles of body mechanics applicable to patient care.
* Demonstrate techniques for specific types of patient transfer.
* Demonstrate select procedures to turn patients who have various health conditions.
* Describe immobilization techniques for various types of procedures and patient conditions.
* Describe specific patient safety measures and concerns.
* Explain the purpose, legal considerations and procedures for incident reporting.
* Describe methods to evaluate patient physical status.
* List the information to be collected prior to a patient examination.
* Describe vital signs and lab values used to assess the condition of the patient, including sites

for assessment and normal values.

* Define terms related to infection control.
* Describe the importance of standard precautions and isolation procedures, including sources

and modes of transmission of infection and disease and institutional control procedures.

* Identify symptoms related to specific emergency situations.
* Describe the institution’s emergency medical code system and the role of the student during a

medical emergency.

* Explain the age-specific considerations necessary when performing radiographic procedures.
* Describe appropriate procedures for management of various types of trauma situations.
* Describe the symptoms and medical interventions for a patient with a contrast agent reaction.
* Explain the role of the radiographer in patient education.
* Describe the patient preparation for contrast studies.
* Identify specific types of tubes, lines, catheters and collection devices.
* Outline the steps in the operation and maintenance of suction equipment.
* Outline the steps in the operation and maintenance of oxygen equipment and demonstrate

proper use.

* Demonstrate competency in basic life support (BLS).
* Describe the steps in performing various mobile procedures.
* Describe the special problems faced in performing procedures on a patient with a

tracheotomy and specific tubes, drains and catheters.

* Describe the procedure for producing diagnostic images in the surgical suite.
* Explain the appropriate radiation protection required when performing mobile/surgical

radiography.

**OPTIONAL COURSES**

**Course Name:** Basic Principals of Computed Tomography

**Course Hours:** 32

**Course Description:** Content is designed to provide entry-level radiography students with an introduction to, and basic understanding of, the operation of a computed tomography (CT) device. Content is not intended to result in clinical competency. Although this may not be seen in the ARRT mandatory or elective radiography clinical competencies, a basic understanding of computed tomography is increasingly expected of new program graduates. In planning student clinical experiences, radiography programs with sufficient local resources are encouraged to provide students with clinical exposure to computed tomography.

**Course Objectives:**

* Explain the difference between reconstructing and reformatting an image.
* Cite the structures demonstrated on commonly performed CT images.
* Describe commonly performed CT procedures.
* Evaluate images for positioning, centering, appropriate anatomy and overall image quality.
* Discuss equipment and supplies necessary to complete commonly performed CT procedures.
* Explain the CT acquisition protocol for commonly performed head/neck, thorax and

abdomen procedures.

* Explain the patient preparation necessary for commonly performed CT contrast studies.
* Name the type, dosage purpose, and route of contrast administration for common CT

procedures.

* Describe the components of the CT imaging system.
* Explain the functions of collimators in CT.
* List the CT computer data processing steps.
* Define algorithm and explain its impact on image scan factors and reconstruction.
* Define raw data and image data.
* Describe the following terms in relation to the CT data acquisition process:
	+ Pixel.
	+ Matrix.
	+ Voxel.
	+ Linear attenuation coefficient.
	+ CT/Hounsfield number.
	+ Partial volume averaging.
	+ Window width (ww) and window level (wl).
	+ Spatial resolution.
	+ Contrast resolution.
	+ Noise.
	+ Annotation.
	+ Region of interest (ROI).
* Name the common controls found on CT operator consoles and describe how and why each is used.
* Identify the types and appearance of artifacts most commonly affecting CT images.
* Name the radiation protection devices that can be used to reduce patient dose in CT and

describe the correct application of each.

* Describe the general purpose of commonly performed CT studies.
* Discuss general radiation safety and protection practices associated with examinations in CT.

**Recommended Resources:**

**Course Name:** Sectional Anatomy

**Course Hours:**

**Course Description:** Content begins with a review of gross anatomy of the entire body. Detailed study of gross anatomical structures will be conducted systematically for location, relationship to other structures and function.

Gross anatomical structures are located and identified in axial (transverse), sagittal, coronal and

orthogonal (oblique) planes. Illustrations and anatomy images will be compared with MR and

CT images in the same imaging planes and at the same level when applicable. The characteristic

appearance of each anatomical structure as it appears on a CT, MR and ultrasound image, when

applicable, will be stressed.

**Course Objectives:**

* Name the anatomical structures located within the head and neck.
* Describe the relationship of each anatomical structure in the head and neck to surrounding structures.
* Describe the function of each anatomical structure in the head and neck.
* Locate each anatomical structure on CT, MR and ultrasound images in the transverse axial, coronal, sagittal and orthogonal (oblique) cross-sectional imaging planes.
* Name the anatomical structures located within the thorax.
* Describe the relationship of each thoracic structure to surrounding structures.
* Describe the function of each anatomical structure located within the thorax.
* Locate each anatomical structure of the thorax on CT, MR and ultrasound images in the transverse axial, coronal, sagittal and oblique imaging planes.
* List and describe the function of each anatomical structure located within the abdomen and pelvis.
* Describe the relationship of each anatomical structure in the abdomen and pelvis to surrounding structures.
* Locate each anatomical structure of the abdomen and pelvis on CT, MR, PET and ultrasound images in the axial, coronal, sagittal and oblique planes.
* Name and describe the function of each anatomical structure located in the upper and lower extremities.
* Locate each anatomical structure in the upper and lower extremities on CT and MR images in the transverse axial, coronal, sagittal and oblique planes.

**Radiologic Science Resources**

This list of radiologic science resources will assist educators in sampling the pool of references and study materials that pertain to medical radiography. The resources list should be viewed as a snapshot of available materials. Omission of any one title is not intentional. Because the creation of literature and media related to the field is dynamic, educators are encouraged to search additional sources for recent updates, revisions and additions to this collection of titles.

**Textbooks**

American Association of Physicists in Medicine. Acceptance Testing and Quality Control of

Photostimulable Storage Phosphor Imaging Systems. Report of AAPM Task Group 10.

www.aapm.org/pubs/reports/RPT\_93.pdf. Published October 2006.

American Association of Physicists in Medicine. An Exposure Indicator for Digital

Radiography. Report of AAPM Task Group 116. www.aapm.org/pubs/reports/RPT\_116.pdf.

Published July 2009.

Adler AM, Carlton R. *Introduction to Radiography and Patient Care*. 4th ed. St. Louis, MO:

Elsevier Saunders; 2007.

Adler AM, Carlton R, Poelhuis DJ, Kowalczyk NK. *Workbook W/Lab Exercises for Principles of Radiographic Imaging*. 4th ed. Albany, NY: Delmar Thomson Learning; 2006.

Adolina VF, Lille SL. *Mammographic Imaging: A Practical Guide.* 3rd ed. Philadelphia, PA:

Wolters Kluwer/Lippincott Williams & Wilkins Health; 2010.

Applegate E. *The Sectional Anatomy Learning System: Concepts and Applications*. 3rd ed. St. Louis, MO: Saunders/Elsevier; 2010.

Biedrzycki A. *The Radiography Procedure and Competency Manual.* 2nd ed. Philadelphia, PA: F.A. Davis; 2008.

Blickman H. *Pediatric Radiology.* 3rd ed. St. Louis, Mo: Mosby-Year Book Inc.; 2009.

Bonnick SL. *Bone Densitometry in Clinical Practice: Application & Interpretation.* New York, NY: Springer; 2009.

Bontrager K, Lampignano J. *Pocket Atlas-Handbook of Radiographic Positioning and*

*Techniques*. 7th ed. St. Louis, MO: Elsevier Mosby; 2010.

Bontrager K. *Radiographic Positioning and Related Anatomy*. 7th ed. St. Louis, MO: Elsevier Mosby; 2009.

Bontrager K, Lampignano J. *Workbook and Laboratory Manual*, 7th ed. Volumes I and II. St. Louis, MO: Elsevier Mosby; 2009.

Brennan P, Seeram E. *Digital Radiography.* Ames, IA: Blackwell Publishing Professional; 2007.

Browne MN, Keeley SM. *Asking the Right Questions: A Guide to Critical Thinking*. 9th ed.

Upper Saddle Rivers, NJ: Prentice Hall; 2010.

Bushberg JT, et al. *The Essential Physics of Medical Imaging*, 3rd, North American Edition;

2012

Bushong SC. *Magnetic Resonance Imaging: Physical and Biological Principles.* 4th ed. St.

Louis, MO: Mosby; 2015.

Bushong SC. *Mosby's Radiography Online: Radiobiology and Radiation Protection.* 9th ed. St. Louis, MO: Mosby; 2008.

Bushong SC. *Mosby's Radiography Online: Radiographic Imaging.* 9th ed. St. Louis, MO:

Mosby; 2008.

Bushong SC. *Mosby's Radiography Online: Radiologic Physics.* 9th ed. St. Louis, MO: Mosby; 2008.

Bushong SC. *Radiologic Science for Technologists: Physics, Biology, and Protection.* 11th ed. St. Louis, MO: Mosby; 2017.

Bushong SC. *Radiologic Science for Technologists Workbook and Laboratory Manual*. 9th ed. St. Louis, MO: Mosby; 2008.

Callaway WJ. *Mosby’s Comprehensive Review of Radiography.* 6th ed. St. Louis, MO:

Elsevier/Mosby; 2012.

Callaway WJ, Gurley LT. *Introduction to Radiologic Technology.* 7th ed. St. Louis, MO:

Elsevier/Mosby; 2010.

Campeau F, Fleitz J. *Limited Radiography.* 3rd ed. Albany, NY: Delmar Publishers, Inc; 2009.

Carlton RR, Adler AM. *Principles of Radiographic Imaging: An Art and a Science.* 4th ed.

Albany, NY: Delmar Publishers; 2006.

Carlton RR, Greathouse JS. *Delmar’s Principles of Radiographic Positioning & Procedures*

*Pocket Guide*. Albany, NY: Delmar Publishers; 2005.

Carroll QB. *Fuch’s Radiographic Exposure, Processing, and Quality Control*. 7th ed.

Springfield, IL: Charles C. Thomas; 2003.

Carroll QB. *Instructor Resources for Radiography in the Digital Age*. 2nd ed. 2014

Carroll QB. *Practical Radiographic Imaging.* 8th ed.; 2007

Carroll QB. *Radiography in the Digital Age.* 2nd ed.. Springfield, IL: Charles C. Thomas; 2014.

Carroll QB. *Radiography in the Digital Age*: *Instructor PowerPoint Slide Series.* 2nd ed.; 2014

Carroll QB. *Radiography in the Digital Age: Physics, Exposure, Radiation Biology* 2nd Edition; Charles C. Thomas; 2014

Carroll QB. *Student Workbook for Radiography in the Digital* (2nd Ed.); 2014

Carroll QB., Bowman D. *Adaptive Radiography with Trauma, Image Critique and Critical*

*Thinking* 1st ed; 2014.

Carter C, Vealé B. *Digital Radiography and PACS*. 1st ed. revised. St. Louis, MO:

Mosby/Elsevier; 2009.

Chabner DE. *The Language of Medicine.* 10th ed. Philadelphia, PA: W.B. Saunders; 2014.

Cummings GR, Meizner E. *Corectec’s Comprehensive Set of Review Questions for*

*Radiography.* 5th ed. Athens, GA: Corectec; 2005.

Dahnert W. *Radiology Review Manual.* 7th ed. Philadelphia, PA: Williams & Wilkins; 2011.

ISBN 1609139437

Daldrup-Link HE, Gooding CA. *Essentials of Pediatric Radiology: A Multimodality Approach*. New York, NY: Cambridge University Press; 2010.

Dance DR, et al. *Diagnostic radiology physics: A Handbook for Teachers and Students*, 1st ed. Vienna: International Atomic Energy Agency, 2014.

Davidhizar RE, Newman Giger J. (editors). *Transcultural Nursing: Assessment & Intervention*. 5th ed. St. Louis, MO: Mosby; 2007.

DeMaio D. *Mosby's Exam Review for Computed Tomography*. 2nd ed. St. Louis, MO: Mosby Elsevier; 2011.

Diestler S. *Becoming a Critical Thinker: A User Friendly Manual*. 4th ed. Upper Saddle River, NJ: Prentice Hall; 2008.

Diller JV. *Cultural Diversity: A Primer for the Human Services*. 4th ed. Belmont, CA:

Brooks/Cole, Cengage Learning; 2011.

Drafke MW, Nakayama H. *Trauma and Mobile Radiography*. 2nd ed. Philadelphia, PA: F.A.

Davis; 2001.

Dreyer KJ, Mehta A, Thrall JH, Hisrchorn DS, eds. *PACS – A Guide to the Digital Revolution*. 2nd ed. New York, NY: Springer; 2005.

Eisenberg RL, Johnson NM. *Comprehensive Radiographic Pathology*. 4th ed. St. Louis, MO:

Mosby; 2007.

Eisenberg RL, Johnson NM. *Workbook for Comprehensive Radiographic Pathology*. 4th ed. St. Louis, MO: Mosby; 2007.

Erlich RA, Daly JA. *Patient Care in Radiography: With an Introduction to Medical Imaging*. 7th ed. St. Louis, MO: Mosby; 2008.

Erkonen WE, Smith WL, eds. *Radiology 101: The Basics and Fundamentals of Imaging.* 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2009.

Fauber TL. *Radiographic Imaging and Exposure*, 4th ed. Elsevier; 2013.

Forshier S. *Essentials of Radiation: Biology and Protection*. 2nd ed. Clifton Park, NY: Delmar; 2008.

Fosbinder RA, Mason S. *Essentials of Radiologic Science*. Philadelphia, PA: Wolters Kluwer

Health/Lippincott Williams & Wilkins; 2011.

Fosbinder RA, Orth D. *Essentials of Radiologic Science Workbook*. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2011.

Long BW, Rollins, JH, Smith BJ. *Merrill’s Atlas of Radiographic Positions & Radiologic*

*Procedures.* 12th ed. St. Louis, MO: Elsevier/Mosby; 2016. 13th edition

Long BW, Curtis, T., Smith BJ. *Merrill's Pocket Guide to Radiography.* 13th ed. St. Louis, MO: Mosby; 2016.

Long, BW, Smith, BJ. *Mosby's Radiography Online: Anatomy and Positioning for Merrill's*

*Atlas of Radiographic Positioning & Procedures.* 12th ed. St. Louis, MO: Mosby; 2016. 13th

edition

Long BW, Smith BJ, Curtis, *Workbook for Merrill’s Atlas of Radiographic Positions &*

*Radiologic Procedures.* 12th ed. St. Louis, MO: Mosby; 2016. 13th edition

Gollnick DA. *Basic Radiation Protection Technology.* 54th ed. Altadena, CA: Pacific Radiation Corp.; 2006.

Graham D, Cloke P, Vosper M. *Principles and Applications of Radiological Physics*. 6th ed.

New York, NY: Churchill Livingstone; 2011.

Gunn C. *Digital and Radiographic Imaging: A Practical Approach*. 4th ed. New York, NY:

Churchill Livingstone; 2008.

Gunn C. *Digital and Radiographic Imaging: A Practical Approach*, 4th ed. Churchill

Livingstone; 2009.

Gurley LT, Callaway WJ. *Introduction to Radiologic Technology*. 7th ed. St. Louis, MO**:** CV

Mosby; 2011.

Guy JF. *Learning Human Anatomy: A Laboratory Text and Workbook.* 4th ed. Upper Saddle

River, NJ: Pearson Prentice Hall; 2008.

Gylys BA, Masters RM. *Medical Terminology Simplified: A Programmed Learning Approach by Body System*. 54th ed. Philadelphia, PA: F.A. Davis Co.; 2014.

Hall EJ, Giaccia AJ. *Radiobiology for the Radiologist*. 76th ed. Philadelphia, PA: Lippincott

Williams & Wilkins; 2011.

Hardy M, Snaith B. *Musculoskeletal Trauma: A Guide to Assessment and Diagnosis*. Edinburgh, UK: Churchill Livingstone; 2010.

Harvey CP, Allard MJ. *Understanding and Managing Diversity: Readings, Cases, and*

*Exercises*. 64th ed. Upper Saddle River, NJ: Prentice Hall; 2014.

Hendee WR, Ritenour ER. *Medical Imaging Physics*. 4th ed. Hoboken, NJ: Wiley-Liss; 2002.

Herrmann et al. American Society of Radiologic Technologists (2012). *Best practices in digital radiography (white paper)*. Albuquerque, NM.

Huang HK. *PACS and Imaging Informatics*. 2nd ed. Hoboken, NJ: Wiley-Liss; 2010.

Huda W, Slone RM. *Review of Radiologic Physics*. 3rd ed. Philadelphia, PA: Lippincott

Williams & Wilkins; 2009.

Lanca L, Silva A. *Digital Imaging Systems for Plain Radiography* Springer 2013.

Lavery, J., Hughes W., Doran, K *Critical Thinking: An Introduction to the Basic Skills*. 6th ed. Peterborough, Ontario: Broadview Press; 2009.

Jensen SC, Peppers MP. *Pharmacology and Drug Administration for Imaging Technologists.*

2nd ed. St. Louis, MO: CV Mosby; 2006.

Johnston J, Fauber TL. *Essentials of Radiographic Physics and Imaging*. St. Louis, MO: Mosby; 2011.

Kelley LL, Peterson CM. *Sectional Anatomy for Imaging Professionals* 3rd ed. St. Louis, MO: Mosby; 2012

Kelley LL, Peterson CM. *Workbook for Sectional Anatomy for Imaging Professionals.* 2nd ed. St. Louis, MO: Mosby; 2007.

Kowalczyk N, Mace JD. *Radiographic Pathology for Technologists*. 5th ed. St. Louis, MO:

Mosby/Elsevier; 2008. 6th ed with 7th ed to come in 2017 or 2018

LaGuardia D, Guth HP. *American Voices: Culture and Community*. 6th ed. Mountain View, CA: Mayfield Publishing Co.; 2006.

Lazo DL. *Fundamentals of Sectional Anatomy*. Clifton Park, NJ: Thomson Delmar Learning;

2005.

Madden ME. *Introduction to Sectional Anatomy*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2007.

Madden ME. *Sectional Anatomy Review*. Philadelphia, PA: Lippincott, Williams &Wilkins;

2001.

Marieb EN, Hoehn K. *Human Anatomy & Physiology*. 8th ed. San Francisco, CA: Benjamin

Cummings; 2010.

Martin JE. *Physics for Radiation Protection.* 2nd ed. Weinheim, Germany: Wiley-VCH; 2006.

McCance KL, Huether SE. *Pathophysiology: The Biologic Basis for Disease in Adults and*

*Children*. 6th ed. Maryland Heights, MO: Mosby Elsevier; 2009.

McQuillen Martensen K. *Radiographic Image Analysis*. 3rd ed. Philadelphia, PA:

Elsevier/Saunders; 2011.

Meistrich ML. *Radiation Protection Guidance*. Bethesda, MD: National Council on Radiation Protection and Measurements; 2000.

Mettler FA, Upton AC. *Medical Effects of Ionizing Radiation.* 3rd ed. Philadelphia, PA:

Saunders/Elsevier; 2008.

Mulvihill ML, et al. *Human Disease: A Systemic Approach.* 7th ed. Upper Saddle River, NJ:

Pearson Education; 2009.

*NCRP Reports -* www.ncrppublications.org. Bethesda, MD: National Council on Radiation

Protection and Measurements.

Nosich GM. *Learning to Think Through: A Guide to Critical Thinking Across the Curriculum*. 3rd ed. Upper Saddle River, NJ: Prentice Hall; 2008.

O’Neil SL, Chapman EN. *Your Attitude is Showing*. 12th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2007.

Papp J. *Quality Management in the Imaging Sciences*. 4th ed. St. Louis, MO: Mosby Elsevier; 2011.

Parelli RJ. *Medicolegal Issues for Radiographers.* 4th ed. Boca Raton, FL: CRC Press/Taylor & Francis Group; 2008.

Pianykh OS. *Digital Imaging and Communications in Medicine (DICOM): A Practical*

*Introduction and Survival Guide*. NY, NY: Springer; 2010.

Perkins M. *The Practical Guide to Digital Imaging: Mastering the Terms, Technologies, and*

*Techniques*. Buffalo, NY: Amherst Media; 2005.

Poelhuis DJ, Kowalczyk N, Carlton R, Adler AM. *Workbook W/Lab Exercises for Principles of Radiographic Imaging.* 4th ed. Albany, NY: Delmar Publishers; 2005.

Purtilo RB, Doherty R. *Ethical Dimensions in the Health Professions.* 5th ed. St. Louis, MO:

Elsevier/Saunders; 2010.

Ruggiero VR. *Becoming a Critical Thinker*. 6th ed. Boston, MA: Houghton Mifflin; 2008.

Saia DA. *Appleton & Lange's Review for the Radiography Examination*. 94th ed. New York,

NY: McGraw-Hill/Appleton & Lange; 2012.

Saia DA. *Radiography PREP: Program Review & Exam Preparation.* 6th ed. New York, NY: McGraw-Hill; 2011.

Seeram E. *Computed Tomography*: *Physical Principles, Clinical Applications, and Quality*

*Control.* 4th ed. Philadelphia, PA: Saunders; 2015.

Seeram E. *Digital Radiography: An Introduction for Technologists.* Clifton Park, NY: Delmar Cengage Learning; 2011.

Seeram E. *Rad Tech’s Guide to Radiation Protection.* Malden, MA: Blackwell Science; 2001.

Shephard C. *Radiographic Image Production and Manipulation*. New York, NY: McGraw-Hill; 2003.

Shier D, Butler J, Lewis R. *Hole's Human Anatomy & Physiology*. 12th ed. Boston, MA:

McGraw-Hill Higher Education; 2009.

Snopek AM. *Fundamentals of Special Radiographic Procedures.* 5th ed. Philadelphia, PA: WB Saunders; 2006.

Spector RE. *Cultural Diversity in Health & Illness*. 9th ed. New York, NY: Pearson; 2016.

Squire LF, Novelline RA. *Fundamentals of Radiology.* 6th ed. Cambridge, MA: Harvard

University Press; 2004.

Statkiewicz-Sherer MA. *Workbook for Radiation Protection in Medical Radiography.* 7th ed. St. Louis, MO: Mosby; 2015.

Statkiewicz-Sherer MA, Visconti PJ, Ritenour ER. *Radiation Protection in Medical*

*Radiography*. 7th ed. Maryland Heights, MO: Mosby Elsevier; 2015.

Swartz JD, Loevner L. *Imaging of the Temporal Bone.* 4th ed. New York, NY: Thieme Medical Publishers, Inc.; 2008.

Torres LS, Dutton AG, Linn-Watson Norcutt TA. *Basic Medical Techniques & Patient Care in Imaging Technology.* 8th ed. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2012.

Tortorici M. *Advanced Radiographic and Angiographic Procedures: With an Introduction to*

*Specialized Imaging.* Philadelphia, PA: F.A. Davis; 2010.

Towsley-Cook DM, Young TA. *Ethical and Legal Issues for Imaging Professionals.* 2nd ed. St. Louis, MO: Mosby; 2007

Wolbarst AB. *Physics of Radiology*. 2nd ed. Madison, WI: Medical Physics; 2005.

**Journals**

*Applied Radiology.* Anderson Publishing Ltd, Ocean, NJ.

*Diagnostic Imaging*. United Business Media, San Francisco, CA*.*

*Journal of Medical Imaging and Radiation Sciences.* Published by Elsevier for the Canadian

Association of Medical Radiation Technologists (CAMRT).

*Journal of Vascular Technology*. Society of Vascular Technology, Lanham, MD.

*Radiography.* The College of Radiographers, St. Louis, MO.

*Radiologic Science and Education.* Association of Educators in Imaging and Radiological

Sciences, Albuquerque, NM.

*Radiologic Technology.* American Society of Radiologic Technologists, Albuquerque, NM.

*Radiology.* Radiological Society of North America, Oak Brook, IL.

©Copyright 2017 American Society of Radiologic Technologists. All rights reserved.