Florida Department of Education
Curriculum Framework

Program Title: **Radiography**
Career Cluster: **Health Science**

AS	
CIP Number	1351091100
Program Type	College Credit
Standard Length	77 credit hours
CTSO	HOSA: Future Health Professionals
SOC Codes (all applicable)	29-2034 Radiologic Technologists
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Health Science career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of Health Science career cluster.

The purpose of this program is to prepare students for employment as Radiographers, Radiologic Technologists SOC Code 29-2034 (Radiologic Technologists/Technicians) or to provide supplemental training for persons previously or presently employed in these occupations.

The content includes but is not limited to introduction to radiography, medical ethics and law, medical terminology, methods of patient care, human structure and function, radiographic procedures, principles of radiographic exposure, imaging equipment, image processing, radiation physics, principles of radiation protection, principles of radiation biology, radiographic pathology, introduction to quality assurance, introduction to computer literacy, and clinical education. The curriculum includes a plan for well-structured competency based clinical education.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 77 credit hours.

Regulated Programs

The program must be approved by the Department of Health, Bureau of Radiation Control so that the graduate is eligible for licensure in Florida as a Certified Radiologic Technologist. As specified in Chapter 468 Part IV F.S. and Chapter 64E-3 F.A.C.

The program must be accredited. by the Joint Review Committee on Education in Radiologic Technology (JRCERT), 20 North Wacker Drive, Suite 900, Chicago, Illinois 60606-2901, (312) 704-5300, or by the Southern Association of Colleges and Schools.

Program completers will be eligible to make an application to take the National Registry examination. For further information contact:

American Registry of Radiologic Technologists (ARRT)
1255 Northland Drive
St. Paul, MN 55120-1155
(612) 687-0048

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate a functional knowledge of medical terminology required in radiologic science.
02.0 Convey an understanding of the ethics and laws that impact Radiologic Sciences at both the state and federal levels.
03.0 Demonstrate introductory knowledge of radiologic science and the health care system.
04.0 Demonstrate knowledge of and perform patient care procedures required in radiologic sciences.
05.0 Demonstrate an understanding of pharmacology and venipuncture procedures as it relates to radiologic science.
06.0 Demonstrate proficiency in the skills, techniques and knowledge required for image analysis.
07.0 Demonstrate proficiency in the skills, techniques and knowledge required to operate imaging equipment.
08.0 Convey an understanding of the principles of imaging and the various factors that contribute to accuracy including x-ray production, image formation, and factors related to radiographic quality.
09.0 Demonstrate an understanding of the structure and function of the human body with a focus on the muscular, endocrine, respiratory, urinary and appendicular skeletal systems.
10.0 Demonstrate proficiency in the skills, techniques and knowledge required to perform accurate radiographic procedures.
11.0 Demonstrate the proficiency in the skills and knowledge required of clinical practice.
12.0 Convey an understanding of the principles of imaging and the various factors that contribute to accuracy including image acquisition and processing, scatter radiation control, and image evaluation.
13.0 Demonstrate an understanding of the concepts and equipment required of digital image acquisition and display.
14.0 Demonstrate an understanding of the structure and function of the human body with a focus on the axial skeletal system.
15.0 Demonstrate an understanding of the structure and function of the human body with a focus on the circulatory/cardiovascular, digestive and reproductive systems.
16.0 Demonstrate proficiency in the skills, techniques and knowledge required to perform accurate fluoroscopic procedures.
17.0 Demonstrate an understanding of the structure and function of the human body with a focus on the nervous system.
18.0 Demonstrate introductory knowledge of computed tomography.
19.0 Demonstrate appropriate venipuncture technique.
20.0 Demonstrate an understanding of radiographic pathology.
21.0 Demonstrate an understanding of how radiation is produced and the characteristics of different classifications of radiation.
22.0 Demonstrate an understanding of the structure and function of the human body including the immune system and chemical composition of the body.
23.0 Demonstrate an understanding of the integral aspects of radiation biology required of a radiographer.
24.0 Convey the importance for proper radiation protection and the precautions radiographers should take to prevent unnecessary exposure to themselves and patients.

Florida Department of Education
Student Performance Standards

Program Title: **Radiography**
CIP Number: **1351091100**
Program Length: **77 credit hours**
SOC Code(s): **29-2034**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate a functional knowledge of medical terminology required in radiologic science. – The student will be able to:
01.01	Apply the word-building process for medical terminology.
01.02	Interpret medical abbreviations and symbols.
01.03	Critique orders and requests.
01.04	Define medical imaging and radiation.
01.05	Translate medical terms, abbreviations and symbols into layman's terms.
02.0	Convey an understanding of the ethics and laws that impact Radiologic Sciences at both the state and federal levels. – The student will be able to:
02.01	Discuss the origins of medical ethics.
02.02	Apply medical/professional ethics in the context of a broader societal ethic.
02.03	Explain the role of ethical behavior in health care delivery.
02.04	Explain concepts of personal honesty, integrity, accountability, competence and compassion as ethical imperatives in health care.
02.05	Identify legal and professional standards and relate each to practice in health professions.
02.06	Identify specific situations and conditions that give rise to ethical dilemmas in health care.
02.07	Explain select concepts embodied in the principles of patients' rights, the doctrine of informed (patient) consent and other issues related to patients' rights.

02.08	Explain the legal implications of professional liability, malpractice, professional negligence, and other legal doctrines applicable to professional practice.
02.09	Describe the importance of timely, accurate, and comprehensive methods of documentation as a legal and ethical imperative.
02.10	Explore theoretical situations and questions relating to the ethics of health care delivery.
02.11	Explain legal terms, principles, doctrines and laws specific to the radiologic sciences.
02.12	Outline the conditions necessary for a valid malpractice claim in medical imaging.
02.13	Describe institutional and professional liability protection typically available to the radiographer.
02.14	Describe the components and implications of informed consent.
02.15	Identify standards for informed consent and disclosure of protected health information (PHI).
02.16	Describe how consent forms are used relative to specific radiographic procedures.
02.17	Differentiate between civil and criminal liability.
02.18	Define tort and explain the differences between intentional and unintentional torts.
03.0	Demonstrate introductory knowledge of radiologic science and the health care system. – The student will be able to:
03.01	Identify health science professions that participate in the total health care of the patient.
03.02	Identify various settings involved in the delivery of health care.
03.03	Discuss the reimbursement/payment options for health care services.
03.04	Discuss the role and value of a mission statement to the operation of a healthcare institution.
03.05	Describe relationships and interdependencies of departments within a health care institution.
03.06	Discuss the responsibilities and relationships of all personnel in the radiology department.
03.07	Differentiate between quality assurance (QA) and continuous quality improvement (CQI).
03.08	Differentiate between accreditation types.
03.09	Define credentialing, national certification, registration, and state licensure.
03.10	Discuss career opportunities and advancement for the radiographer.
03.11	Identify the benefits of continuing education as related to improved patient care and professional development.

	03.12	Describe the types, purpose, and functions of professional organizations (ASRT).
	03.13	Identify educational and certifications requirements.
	03.14	Identify state and federal regulatory agencies.
04.0	Demonstrate knowledge of and perform patient care procedures required in radiologic sciences. – The student will be able to:	
	04.01	Identify the responsibilities of the health care facility and members of the health care team.
	04.02	List the general responsibilities of the radiographer.
	04.03	Describe the practice standards for the radiographer as defined by the ASRT and state licensure.
	04.04	Differentiate between culture and ethnicity.
	04.05	Explain perceptions of dying and death from the viewpoint of both patient and radiographer.
	04.06	Identify methods for determining the correct patient for a given procedure.
	04.07	Explain the use of various communication models.
	04.08	Explain specific aspects of a radiographic procedure to the patient.
	04.09	Demonstrate correct principles of body mechanics applicable to patient care.
	04.10	Demonstrate techniques for specific types of patient transfer.
	04.11	Demonstrate select procedures to turn patients who have various health conditions.
	04.12	Describe immobilization techniques for various types of procedures and patient conditions.
	04.13	Describe specific patient safety measures and concerns.
	04.14	Explain the purpose, legal considerations and procedures for incident reporting.
	04.15	Describe methods to evaluate patient physical status.
	04.16	List the information to be collected prior to a patient examination.
	04.17	Describe vital signs and lab values used to assess the condition of the patient, including sites for assessment and normal values.
	04.18	Define terms related to infection control.
	04.19	Describe the importance of standard precautions and isolation procedures, including sources and modes of transmission of infection and disease and institutional control procedures.

04.20	Identify symptoms related to specific emergency situations.
04.21	Describe the institution's emergency medical code system and the role of the student during a medical emergency.
04.22	Explain the age-specific considerations necessary when performing radiographic procedures.
04.23	Describe appropriate procedures for management of various types of trauma situations.
04.24	Describe the symptoms and medical interventions for a patient with a contrast agent reaction.
04.25	Explain the role of the radiographer in patient education.
04.26	Describe the patient preparation for contrast studies.
04.27	Identify specific types of tubes, lines, catheters and collection devices.
04.28	Outline the steps in the operation and maintenance of suction equipment.
04.29	Outline the steps in the operation and maintenance of oxygen equipment and demonstrate proper use.
04.30	Demonstrate competency in basic life support (BLS).
04.31	Describe the steps in performing various mobile procedures.
04.32	Describe the special problems faced in performing procedures on a patient with a tracheotomy and specific tubes, drains, and catheters.
04.33	Describe the procedure for producing diagnostic images in the surgical suite.
04.34	Explain the appropriate radiation protection required when performing mobile/surgical radiography.
05.0	Demonstrate an understanding of pharmacology and venipuncture procedures as it relates to radiologic science. – The student will be able to:
05.01	Distinguish between the chemical, generic and trade names of various drugs.
05.02	Describe the pharmacokinetic, pharmacodynamics, and pharmacogenetic principles of drugs.
05.03	Explain the uses and impact on the patient of different categories of drugs.
05.04	Define the categories of contrast agents and give specific examples for each category.
05.05	Explain the pharmacology of contrast agents.
05.06	Describe methods and techniques for administering various types of contrast agents.
05.07	Identify and describe the routes of drug administration.

06.0	Demonstrate proficiency in the skills, techniques and knowledge required for image analysis. – The student will be able to:
06.01	Discuss the elements of a radiographic image.
06.02	Identify anatomy on radiographic images.
06.03	Apply a problem-solving process used for image analysis.
06.04	Describe an effective image analysis method.
06.05	Describe the role of the radiographer in image analysis.
06.06	Apply the process for evaluating images for adequate image receptor exposure, exposure indicator, contrast/greyscale/spatial resolution, identification markers, and appropriate use of beam restriction.
06.07	Summarize the importance of proper positioning.
06.08	Discuss the impact of patient preparation on the resulting radiographic image.
06.09	Identify common equipment malfunctions that affect image quality, and corrective action.
06.10	Differentiate between technical factor problems, procedural factor problems and equipment malfunctions.
06.11	Critique images for appropriate technical, procedural and pathologic factors, and employ corrective actions if necessary.
06.12	Differentiate images produced by various modalities.
06.13	Apply a process for evaluating images for acceptable limits of distortion, image artifacts, radiation fog, noise, and gross exposure.
07.0	Demonstrate proficiency in the skills, techniques and knowledge required to operate imaging equipment. – The student will be able to:
07.01	Describe potential difference, current and resistance.
07.02	Describe the general components and functions of the tube and filament circuits.
07.03	Compare generators in terms of radiation produced and efficiency.
07.04	Discuss mobile and fixed radiographic equipment in terms of purpose, components, types and applications.
07.05	Demonstrate operation of various types of permanently fixed and mobile radiographic equipment.
07.06	Discuss fixed, fluoroscopy, and mobile equipment in terms of purpose, components, types, and applications.
07.07	Describe the components and function of automatic exposure control (AEC) devices.
07.08	Demonstrate proper use of AEC devices.

	07.09 Describe the components of diagnostic x-ray tubes.
	07.10 Explain methods used to extend x-ray tube life.
	07.11 Explain image-intensified, flat panel, and pulsed fluoroscopy.
	07.12 Indicate the purpose, construction, and application of fluoroscopic monitor.
	07.13 Differentiate between quality assurance (QA) and quality control (QC).
	07.14 List the benefits of a quality control management to the patient and to the department.
	07.15 Evaluate the results of standard QC tests.
	07.16 Discuss the image appearance and basic principles of operation for equipment used in various imaging modalities.
	07.17 Describe continuous quality improvement (CQI).
	07.18 Describe the components of the various types of display monitors.
	07.19 Compare monitor types (e.g. acquisition, display).
	07.20 Discuss quality control (QC) for imaging equipment and accessories.
	07.21 Discuss the appropriate use of electronic masking.
	07.22 Recognize and compare basic equipment used in various imaging modalities.
08.0	Convey an understanding of the principles of imaging and the various factors that contribute to accuracy including x-ray production, image formation, and factors related to radiographic quality. – The student will be able to:
	08.01 Discuss practical considerations in setting standards for acceptable image quality.
	08.02 Assess radiographic exposure on radiographic images.
	08.03 Analyze the relationships of factors that control and affect image exposure.
	08.04 Critique the radiographic contrast within various radiographic images.
	08.05 Analyze the relationship of factors that control and affect radiographic contrast.
	08.06 Critique spatial resolution on various radiographic images.
	08.07 Analyze the relationships of factors that control and affect spatial resolution.
	08.08 Differentiate between size and shape distortion.

08.09	Perform calculations to determine image magnification and percent magnification.
08.10	Summarize the relationship of factors that control and affect distortion.
08.11	Explain the rationale for using beam restriction.
08.12	Describe the operation and applications for different types of beam restriction devices.
08.13	Explain how beam filtration affects x-ray beam intensity, beam quality and patient exposure.
08.14	Describe the change in the half-value layer (HVL) when filtration is added or removed.
08.15	Describe the impact of sampling frequency on spatial resolution.
08.16	Define sampling frequency.
08.17	Describe the impact of detector element size on spatial resolution.
08.18	Describe the Nyquist-Shannon theorem as it relates to sampling frequency.
08.19	Describe the process of image stitching.
09.0	Demonstrate an understanding of the structure and function of the human body with a focus on the muscular, endocrine, respiratory, urinary and appendicular skeletal systems. – The student will be able to:
09.01	Discuss the basics of anatomical nomenclature.
09.02	Classify tissue types, describe the functional characteristics of each and give examples of their location within the human body.
09.03	Describe the composition and characteristics of bone.
09.04	Identify and locate the bones of the human skeleton.
09.05	Identify bony processes and depressions found on the human skeleton.
09.06	Summarize the functions of the skeletal system.
09.07	Label different types of articulations.
09.08	Compare the types, locations and movements permitted by the different types of articulations.
09.09	Examine how muscle is organized at the gross and microscopic levels.
09.10	Differentiate between the structures of each type of muscle tissue.
09.11	State the function of each type of muscle tissue.

	09.12 Name and locate the major muscles of the skeleton.
	09.13 Define endocrine.
	09.14 Describe the characteristics and functions of the components that comprise the endocrine system.
	09.15 Differentiate between peritoneum, omentum, and mesentery.
	09.16 Label the components of the respiratory system.
	09.17 Describe the physiology and regulation of respiration.
	09.18 Label the parts of the kidneys, ureters, bladder and urethra.
	09.19 Describe the function of each organ of the urinary system.
	09.20 Describe the composition and formation of urine.
	09.21 Explain micturition.
	09.22 Identify major sectional anatomical structures found within the head and neck, thorax, and abdomen.
10.0	Demonstrate proficiency in the skills, techniques and knowledge required to perform accurate radiographic procedures. – The student will be able to:
	10.01 Describe standard positioning terms.
	10.02 Demonstrate proper use of positioning aids.
	10.03 Discuss general procedural considerations for radiographic exams.
	10.04 Identify methods and barriers of communication and describe how each may be used or overcome effectively during patient education.
	10.05 Explain radiographic procedures to patients/family members.
	10.06 Modify directions to patients with various communication problems.
	10.07 Develop an awareness of cultural factors that necessitate adapting standard exam protocols.
	10.08 Adapt general procedural considerations to specific clinical settings.
	10.09 Identify the structures demonstrated on routine radiographic images.
	10.10 Adapt radiographic procedures for special considerations.
	10.11 Simulate radiographic procedures on a person or phantom in a laboratory or clinical setting.

10.12	Evaluate images for positioning, centering, appropriate anatomy and overall image quality.
10.13	Discuss equipment and supplies necessary to complete basic radiographic procedures.
10.14	Explain the routine and special positions and projections for all radiographic procedures.
10.15	Describe the general purpose of radiographic studies.
10.16	Apply general radiation safety and protection practices associated with radiographic examinations.
10.17	Define region of interest (ROI).
10.18	Define basic terms related to indications and contraindications related to imaging studies.
11.0	Demonstrate the proficiency in the skills and knowledge required of clinical practice. – The student will be able to:
11.01	Exercise the priorities required in daily clinical practice.
11.02	Execute medical imaging procedures under the appropriate level of supervision.
11.03	Adhere to team practice concepts that focus on organizational theories, roles of team members and conflict resolution.
11.04	Adapt to changes and varying clinical situations.
11.05	Describe the role of health care team members in responding/reacting to a local or national emergency.
11.06	Provide patient-centered, clinically effective care for all patients regardless of age, gender, disability, special needs, ethnicity, or culture.
11.07	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.
11.08	Integrate appropriate personal and professional values into clinical practice.
11.09	Recognize the influence of professional values on patient care.
11.10	Explain how a person’s cultural beliefs toward illness and health affect his or her health status.
11.11	Use patient and family education strategies appropriate to the comprehension level of the patient/family.
11.12	Provide desired psychosocial support to the patient and family.
11.13	Demonstrate competent assessment skills through effective management of the patient’s physical and mental status.
11.14	Respond appropriately to medical emergencies.
11.15	Examine demographic factors that influence patient compliance with medical care.

11.16	Adapt procedures to meet age-specific, disease-specific and cultural needs of patients.
11.17	Assess the patient and record clinical history.
11.18	Demonstrate basic life support procedures.
11.19	Use appropriate charting/electronic documentation methods.
11.20	Recognize life-threatening electrocardiogram (ECG) tracing.
11.21	Apply standard and transmission-based precautions.
11.22	Apply the appropriate medical asepsis and sterile technique.
11.23	Demonstrate competency in the principles of radiation protection standards.
11.24	Apply the principles of total quality management.
11.25	Report equipment malfunctions.
11.26	Examine procedure orders for accuracy and make corrective actions when applicable.
11.27	Demonstrate safe, ethical and legal practices.
11.28	Integrate the radiographer's practice standards into clinical practice setting.
11.29	Maintain patient confidentiality standards and meet HIPAA requirements.
11.30	Demonstrate the principles of transferring, positioning and immobilizing patients.
11.31	Comply with departmental and institutional response to emergencies, disasters and accidents.
11.32	Differentiate between emergency and non-emergency procedures.
11.33	Adhere to national, institutional and departmental standards, policies and procedures regarding care of patients, providing radiologic procedures and reducing medical errors.
11.34	Select technical factors to produce quality diagnostic images with the lowest radiation exposure possible.
11.35	Critique images for appropriate anatomy, image quality and patient identification.
11.36	Determine corrective measures to improve inadequate images.
12.0	Convey an understanding of the principles of imaging and the various factors that contribute to accuracy including image acquisition and processing, scatter radiation control, and image evaluation. – The student will be able to:
12.01	Summarize the relationship of factors affecting scattered radiation.

	12.02 Evaluate the effects of scattered radiation on the image.
	12.03 Compare grid types.
	12.04 Select the most appropriate grid for a given clinical situation.
	12.05 Interpret grid efficiency in terms of grid ratio and frequency.
	12.06 Summarize the factors that influence grid cutoff.
	12.07 Evaluate grid artifacts.
	12.08 Explain the use of radiographic technique charts.
	12.09 Explain exposure factor considerations involved in selecting techniques.
	12.10 Compare fixed kilovoltage peak (kVp) and variable kVp systems.
	12.11 Apply the reciprocity law to clinical situations.
	12.12 Apply conversion factors for changes in the following areas: distance, grid, image receptors, reciprocity law, and 15 percent rule.
13.0	Demonstrate an understanding of the concepts and equipment required of digital image acquisition and display. – The student will be able to:
	13.01 Define terminology associated with digital imaging systems.
	13.02 Describe the various types of digital receptors.
	13.03 Describe the response of digital detectors to exposure variations.
	13.04 Compare the advantages and limits of each receptor type.
	13.05 Evaluate the spatial resolution of a digital imaging system.
	13.06 Describe the histogram and the process or histogram analysis as it relates to automatic rescaling and determining an exposure indicator.
	13.07 Relate the receptor exposure indicator values to technical factors, system calibration, part/beam/plate alignment and patient exposure.
	13.08 Describe the response of PSP systems to background and scatter radiation.
	13.09 Use appropriate means of scatter control.
	13.10 Avoid grid use errors associated with grid cutoff and Moiré effect.
	13.11 Identify common limitations and technical problems encountered when using PSP systems.

13.12	Employ appropriate beam/part/receptor alignment to avoid histogram analysis errors.
13.13	Associate impact of image processing parameters to the image appearance.
13.14	Apply the fundamental principles of radiographic exposure to digital detectors.
13.15	Evaluate the effect of a given exposure change on histogram shape, data width, and image appearance.
13.16	Describe the conditions that cause quantum mottle in a digital image.
13.17	Formulate a procedure or process to minimize histogram analysis and rescaling errors.
13.18	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.
13.19	Describe picture archival and communications system (PACS) and its function.
13.20	Identify components of a PACS.
13.21	Define digital imaging and communications in medicine (DICOM).
13.22	Describe HIPAA concerns with electronic information.
13.23	Identify common problems associated with retrieving/viewing images within a PACS.
13.24	Describe the calculation of the exposure indicator (AAPM Task Group 116).
13.25	Relate how the values of interest (VOI) impact image appearance.
13.26	Describe signal to noise (SNR) as it relates to digital radiography detectors.
13.27	Describe modulation transfer function (MTF) as it relates to digital radiography detectors.
13.28	Describe contrast to noise (CNR) as it relates to digital radiography detectors.
13.29	Describe detective quantum efficiency (DQE) for digital radiography detectors.
13.30	Describe display monitor aspect ratio and its impact on image display.
13.31	Identify critical components of the DICOM header.
13.32	Relate the location and size of the ROI to the appearance of the image and exposure indicator.
13.33	Discuss the impact of viewing angle, luminance, ambient lighting, and pixel size on image display.
14.0	Demonstrate an understanding of the structure and function of the human body with a focus on the axial skeletal system. – The student will be able to:

	14.01 Describe articulations of the axial skeleton.
	14.02 Differentiate the primary and secondary curves of the spine.
	14.03 Identify and locate the bones of the human axial skeleton.
	14.04 Identify bony processes and depressions found on the human axial skeleton.
	14.05 Summarize the functions of the axial skeletal system.
	14.06 Label different types of articulations specific to the axial skeletal system.
15.0	Demonstrate an understanding of the structure and function of the human body with a focus on the circulatory/cardiovascular, digestive, and reproductive systems. – The student will be able to:
	15.01 Describe the composition and characteristics of blood.
	15.02 List the types of blood cells and state their functions.
	15.03 Differentiate between blood plasma and serum.
	15.04 Outline the clotting mechanism.
	15.05 List the blood types.
	15.06 Explain the term Rh factor.
	15.07 Explain the antigen/antibody relationship and its use in blood typing.
	15.08 Label the parts of the human heart.
	15.09 Describe the flow of blood through the body and identify the main vessels.
	15.10 Describe the structure and function of arteries, veins and capillaries.
	15.11 Differentiate between arterial blood in systemic circulation and arterial blood in pulmonary circulation.
	15.12 Outline the major pathways of lymphatic circulation.
	15.13 Correlate cardiac electrophysiology to a normal ECG tracing.
	15.14 Label the anatomy of the male and female reproductive organs.
	15.15 Analyze the function of each of the male and female reproductive organs.
	15.16 Describe the structures and functions of the components that comprise the human eye and ear.

	15.17 List the component body parts involved in the senses of smell and taste.
	15.18 List the somatic senses.
	15.19 Describe the hard and soft palates.
	15.20 Describe the structure and function of the tongue.
	15.21 Identify the structure, function and locations of the salivary glands.
	15.22 List and label the accessory organs of the digestive system and describe their function.
	15.23 Describe the composition and characteristics of the primary organs of the digestive system.
	15.24 Describe the function(s) of each primary organ of the digestive system.
	15.25 Differentiate between the layers of tissue that comprise the esophagus, stomach, small intestine, large intestine, and rectum.
	15.26 Identify the secretions and function of each accessory organ of the digestive system.
	15.27 Explain the purpose of digestion.
	15.28 List the digestive processes that occur in the body.
16.0	Demonstrate proficiency in the skills, techniques and knowledge required to perform accurate fluoroscopic procedures. – The student will be able to:
	16.01 Identify the structures demonstrated on routine fluoroscopic images.
	16.02 Adapt fluoroscopic procedures for special considerations.
	16.03 Simulate fluoroscopic procedures on a person or phantom in a laboratory setting.
	16.04 Evaluate images for positioning, centering, appropriate anatomy and overall image quality.
	16.05 Discuss equipment and supplies necessary to complete basic fluoroscopic procedures.
	16.06 Explain the patient preparation necessary for various contrast and special studies.
	16.07 Explain the routine and special positions/projections for all fluoroscopic procedures.
	16.08 Explain the purpose for using contrast media.
	16.09 Name the type, dosage and route of administration of contrast media commonly used to perform radiographic contrast and special studies.
	16.10 Describe the general purpose of fluoroscopic studies.

	16.11 Apply general radiation safety and protection practices associated with fluoroscopic examinations.
17.0	Demonstrate an understanding of the structure and function of the human body with a focus on the nervous system. – The student will be able to:
	17.01 Differentiate between the structure and function of different types of nerve cells.
	17.02 State the structure of the brain and the relationship of its component parts.
	17.03 Describe brain functions.
	17.04 List the meninges and describe the function of each.
	17.05 Outline how cerebrospinal fluid forms, circulates and functions.
	17.06 Describe the structure and function of the spinal cord.
	17.07 Determine the distribution and function of cranial and spinal nerves.
	17.08 Summarize the structure and function of components that comprise the autonomic nervous system.
18.0	Demonstrate introductory knowledge of computed tomography. – The student will be able to:
	18.01 Explain the difference between reconstructing and reformatting an image.
	18.02 Cite the structures demonstrated on commonly performed CT images.
	18.03 Describe commonly performed CT procedures.
	18.04 Evaluate images for positioning, centering, appropriate anatomy and overall image quality.
	18.05 Discuss equipment and supplies necessary to complete commonly performed CT procedures.
	18.06 Explain the CT acquisition protocol for commonly performed head/neck, thorax, and abdomen procedures.
	18.07 Explain the patient preparation necessary for commonly performed CT contrast studies.
	18.08 Name the type, dosage purpose, and route of contrast administration for common CT procedures.
	18.09 Describe the components of the CT imaging system.
	18.10 Explain the functions of collimators in CT.
	18.11 List the CT computer data processing steps.
	18.12 Define algorithm and explain its impact on image scan factors and reconstruction.

	18.13 Define raw data and image data.
	18.14 Describe the following terms in relation to the CT data acquisition process: a. Pixel. b. Matrix. c. Voxel. d. Linear attenuation coefficient. e. CT/Hounsfield number. f. Partial volume averaging. g. Window width (ww) and window level (wl). h. Spatial resolution. i. Contrast resolution. j. Noise. k. Annotation. l. Region of interest (ROI).
	18.15 Name the common controls found on CT operator consoles and describe how and why each is used.
	18.16 Identify the types and appearance of artifacts most commonly affecting CT images.
	18.17 Name the radiation protection devices that can be used to reduce patient dose in CT and describe the correct application of each.
	18.18 Describe the general purpose of commonly performed CT studies.
	18.19 Discuss general radiation safety and protection practices associated with examinations in CT.
19.0	Demonstrate appropriate venipuncture technique. – The student will be able to:
	19.01 Differentiate between the two major sites of intravenous drug administration.
	19.02 Identify, describe and document complications associated with venipuncture and appropriate actions to resolve these complications.
	19.03 Discuss the various elements of initiating and discontinuing intravenous access.
	19.04 Differentiate and document dose calculations for adult and pediatric patients.
	19.05 Prepare for injection of contrast agents/intravenous medications using aseptic technique.
	19.06 Explain the current legal status and professional liability issues of the radiographer’s role in contrast and/or drug administration.
	19.07 Simulate appropriate venipuncture technique.
20.0	Demonstrate an understanding of radiographic pathology. – The student will be able to:
	20.01 Define basic terms related to pathology.

	20.02 Describe the basic manifestations of pathological conditions and their relevance to radiologic procedures.
	20.03 Discuss the classifications of trauma.
	20.04 Describe imaging procedures used in diagnosing disease.
	20.05 List the causes of tissue disruption.
	20.06 Describe the healing process.
	20.07 Identify complications connected with the repair and replacement of tissue.
	20.08 Describe the various systemic classifications of disease in terms of etiology, types, common sites, complications, and prognosis.
	20.09 Describe the radiographic appearance of diseases.
	20.10 Identify imaging procedures and interventional techniques appropriate for diseases common to each body system.
	20.11 Identify diseases caused by or connected to genetic factors.
21.0	Demonstrate an understanding of how radiation is produced and the characteristics of different classifications of radiation. – The student will be able to:
	21.01 Describe fundamental atomic structure.
	21.02 Describe the electromagnetic spectrum.
	21.03 Describe wavelength and frequency and how they are related to velocity.
	21.04 Explain the relationship of energy, wavelength and frequency.
	21.05 Explain the wave-particle duality phenomena.
	21.06 Identify the properties of x-rays.
	21.07 Describe the processes of ionization and excitation.
	21.08 Describe particulate radiation.
	21.09 Differentiate between ionizing and nonionizing radiation.
	21.10 Describe radioactivity and radioactive decay in terms of alpha, beta and gamma emission.
	21.11 Compare the production of bremsstrahlung and characteristic radiations.
	21.12 Describe the conditions necessary to produce x-radiation.

	21.13 Describe the x-ray emission spectrum.
	21.14 Explain the factors that affect the x-ray emission spectrum.
	21.15 Discuss various photon interactions with matter.
	21.16 Discuss relationships of wavelength and frequency to beam characteristics.
	21.17 Discuss the clinical significance of the photoelectric and modified scattering (Compton) interactions in diagnostic imaging.
	21.18 Compare and contrast different types of radiation.
22.0	Demonstrate an understanding of the structure and function of the human body including the immune system and chemical composition of the body. – The student will be able to:
	22.01 Describe the chemical composition of the human body.
	22.02 Identify cell structure and elements of genetic control.
	22.03 Explain the essentials of human metabolism.
	22.04 Differentiate between nonspecific defenses and specific immunity.
	22.05 Explain antibody production and function.
	22.06 List the different types and functions of T- and B-cells and explain their functions.
23.0	Demonstrate an understanding of the integral aspects of radiation biology required of a radiographer. – The student will be able to:
	23.01 Differentiate between ionic and covalent molecular bonds.
	23.02 Describe principles of cellular biology.
	23.03 Identify sources of electromagnetic and particulate ionizing radiations.
	23.04 Discriminate between the direct and indirect effects of radiation.
	23.05 Identify sources of radiation exposure.
	23.06 Describe radiation-induced chemical reactions and potential biologic damage.
	23.07 Evaluate factors influencing radiobiologic/biophysical events at the cellular and subcellular level.
	23.08 Identify methods to measure radiation response.
	23.09 Describe physical, chemical and biologic factors influencing radiation response of cells and tissues.

	23.10 Explain factors influencing radiosensitivity.
	23.11 Recognize the clinical significance of lethal dose (LD).
	23.12 Identify the radiosensitivity and radioresistency of specific cells.
	23.13 Employ dose response curves to study the relationship between radiation dose levels and the degree of biologic response.
	23.14 Examine effects of limited vs. total body exposure.
	23.15 Relate short-term and long-term effects as a consequence of high and low radiation doses.
	23.16 Differentiate between somatic and genetic radiation effects and discuss specific diseases or syndromes associated with them.
	23.17 Discuss stochastic and deterministic effects.
	23.18 Discuss embryonic and fetal effects of radiation exposure.
	23.19 Discuss risk estimates for radiation-induced malignancies.
	23.20 Discuss acute radiation syndromes.
	23.21 Define basic terms related to dose differences.
24.0	Convey the importance for proper radiation protection and the precautions radiographers should take to prevent unnecessary exposure to themselves and patients. – The student will be able to:
	24.01 Identify and justify the need to minimize unnecessary radiation exposure of humans.
	24.02 Explain the objectives of a radiation protection program.
	24.03 Define radiation and radioactivity units of measurement.
	24.04 Identify effective dose limits (EDL) for occupational and non-occupational radiation exposure.
	24.05 Describe the ALARA concept.
	24.06 Identify the basis for occupational exposure limits.
	24.07 Distinguish between perceived risk and comparable risk.
	24.08 Describe the concept of the negligible individual dose (NID).
	24.09 Identify ionizing radiation sources from natural and man-made sources.
	24.10 Comply with legal and ethical radiation protection responsibilities of radiation workers.

24.11	Describe the relationship between irradiated area and effective dose.
24.12	Describe the theory and operation of radiation detection devices.
24.13	Identify appropriate applications and limitations for each radiation detection device.
24.14	Describe how isoexposure curves are used for radiation protection.
24.15	Identify performance standards for beam-limiting devices.
24.16	Describe procedures used to verify performance standards for equipment.
24.17	Describe the operation of various interlocking systems for equipment.
24.18	Identify conditions and locations evaluated in an area survey for radiation protection.
24.19	Distinguish between controlled and non-controlled areas and list acceptable exposure levels.
24.20	Describe “Radiation Area” signs and identify appropriate placement sites.
24.21	Describe the function of federal, state and local regulations governing radiation protection practices.
24.22	Describe the qualifications and responsibilities of a radiation safety officer.
24.23	Express the need and importance of personnel monitoring for radiation workers.
24.24	Describe personnel monitoring devices, including applications, advantages and limitations for each device.
24.25	Interpret personnel monitoring reports.
24.26	Compare values for individual effective dose limits for occupational radiation exposures (annual and lifetime).
24.27	Identify effective dose limits for the embryo and fetus in occupationally exposed women.
24.28	Distinguish between primary and secondary radiation barriers.
24.29	Demonstrate how the operation of various x-ray and ancillary equipment influences radiation safety and describe the potential consequences of equipment failure.
24.30	Perform calculations of exposure with varying time, distance and shielding.
24.31	Discuss the relationship between workload, energy, half-value layer (HVL), tenth-value layer (TVL), use factor and shielding design.
24.32	Identify emergency procedures to be followed during failures of x-ray equipment.
24.33	Demonstrate how time, distance and shielding can be manipulated to keep radiation exposures to a minimum.

24.34	Explain the relationship of beam-limiting devices to patient radiation protection.
24.35	Discuss added and inherent filtration in terms of the effect on patient dosage.
24.36	Explain the purpose and importance of patient shielding.
24.37	Identify various types of patient shielding and state the advantages and disadvantages of each type.
24.38	Use the appropriate method of shielding for a given radiographic or fluoroscopic procedure.
24.39	Explain the relationship of exposure factors to patient dosage.
24.40	Explain how patient position affects dose to radiosensitive organs.
24.41	Identify the appropriate image receptor that will result in an optimum diagnostic image with the minimum radiation exposure to the patient.
24.42	Select the immobilization techniques used to eliminate voluntary motion.
24.43	Describe the minimum source-to-tabletop distances for fixed and mobile fluoroscopic devices.
24.44	Apply safety factors for the patient, health care personnel and family members in the room during radiographic/fluoroscopic procedures.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

This program meets the Department of Health's education requirements for HIV/AIDS, Domestic Violence and Prevention of Medical Errors. Although not a requirement for initial licensure, it is a requirement for renewal, therefore the instructor may provide a certificate for renewal purposes to the student verifying these requirements have been met.

If students in this program are seeking a licensure, certificate or registration through the Department of Health, please refer to 456.0635 F.S. for more information on disqualification for a license, certificate, or registration through the Department of Health.

Radiographers provide patient services using imaging modalities, as directed by physicians qualified to order and/or perform radiologic procedures. Radiographers usually provide patient care essential to radiologic procedures, including exercising judgment when performing medical imaging procedures. When providing patient services, the radiographer adheres to the principles of radiation protection for the patient, self, and others.

Radiographers accurately demonstrate anatomical structures on various imaging receptors by knowledge of anatomy, positioning, radiographic technique, and radiation protection. Radiographers must also be able to recognize emergency patient conditions and initiate lifesaving first aid. Additional duties may include performing quality assurance, processing film, and keeping patient records. Radiographers may be required to perform some of these duties at the patient's bedside or in the operating room.

The policies and process by which students receive clinical education shall be published and made known to all concerned in order to avoid practices in which students are substituted for paid staff. Students shall not take the responsibility or the place of qualified staff. After demonstrating competency, students may be permitted to perform procedures with indirect supervision. Unsatisfactory radiographs shall be repeated only in the presence of a qualified radiographer.

Students are encouraged to become members of their appropriate professional organizations such as the American Society of Radiologic Technologists (ASRT), Florida Society of Radiologic Technologists (FSRT) and its' local affiliate.

Career and Technical Student Organization (CTSO)

HOSA: Future Health Professionals is the intercurricular career and technical student organization providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Additional Resources

For additional information regarding articulation agreements, Bright Futures Scholarships, Fine Arts/Practical Arts Credit and Equivalent Mathematics and Equally Rigorous Science Courses please refer to:
http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml