Imaging Technology I

PEIMS Code: N1302123
Abbreviation: IMGTECH1
Grade Level(s): 10-11
Award of Credit: 1.0

Approved Innovative Course

- Districts must have local board approval to implement innovative courses.
- In accordance with Texas Administrative Code (TAC) §74.27, school districts must provide instruction in all essential knowledge and skills identified in this innovative course.
- Innovative courses may only satisfy elective credit toward graduation requirements.
- Please refer to TAC §74.13 for guidance on endorsements.

Course Description:

The Imaging Technology I course provides students with the opportunity to learn about standard radiographic positioning and related medical terminology of the chest, abdomen, and upper and lower extremities. The course introduces students to the operation of X-ray equipment, analyzing X-rays, and maintaining diagnostic results. Imaging Technology I prepares students for college, career and military readiness by allowing the student the opportunity to obtain an industry certification, enter the workforce upon graduation from high school, or transition to a postsecondary institution with the prior knowledge to be successful in a radiology career field.

Essential Knowledge and Skills:

(a) General Requirements. This course is recommended for student in grades 10 – 11. The recommended prerequisite is Introduction to Imaging Technology. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and Technical Education instruction provide content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostics services, health informatics, support services and biotechnology research and development.

(3) The Imaging Technology I course provides students with the opportunity to learn about standard radiographic positioning and related medical terminology of the chest, abdomen, and upper and lower extremities. The course introduces students to the operation of X-ray equipment, analyzing X-rays, and maintaining diagnostic results. Imaging Technology I prepares students for college, career and military readiness by

allowing the student the opportunity to obtain an industry certification, enter the workforce upon graduation from high school, or transition to a postsecondary institution with the prior knowledge to be successful in a radiology career field.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Student are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implication of their actions.

(7) Student are expected to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(8) Statements that contain the word “including” reference content that must be mastered, while those containing the phrase “such as” are intended as possible illustrative examples.

(c) Knowledge and Skills.

(1) The student demonstrates professional standards/employability skills as required by industry of medical imaging. The student is expected to:

(A) express ideas in a clear, concise, and effective manner;

(B) cooperate, contribute, and collaborate as a member of a team;

(C) identify and comply with employer expectations such as punctuality, attendance, time management, communication, organizational skills, and productive work habits;

(D) prepare and deliver effective oral presentations; and

(E) accurately interpret, transcribe, and communicate vocabulary appropriate to medical imaging.

(2) The student applies mathematics, science, English language arts, and social studies skills in medical imaging. The student is expected to:

(A) solve mathematical calculations relating to medical imaging;

(B) interpret data from tables, charts, and graphs to provide solutions to medical imaging problems;

(C) interpret complex technical material related to medical imaging;

(D) communicate ideas and responses using medical terminology; and

(E) apply critical thinking and problem solving to make informed decisions.

(3) The student displays verbal and nonverbal communication skills necessary for medical imaging. The student is expected to:

(A) apply verbal and nonverbal communication techniques to various patient interactions; and

(B) demonstrate verbal and nonverbal skills when communicating with patients with language barriers such as foreign languages, hearing loss, vision loss, and loss of speech.

(4) The student describes the academic preparation, career options, and requirements for employment in the medical imaging industry. The student is expected to:

(A) research and present on career options and employment information; and

(B) explain employment processes for diagnostic imaging modalities, including academic requirements, certification, licensure, registration, and continuing education.

(5) The student demonstrates knowledge of the modalities related to medical imaging. The student is expected to:

(A) analyze the advantages and disadvantages of using different imaging modalities including fluoroscopy, sonography, nuclear medicine, magnetic resonance imaging (MRI), computerized tomography (CT), mammography, bone densitometry, positron emission tomography (PET), and fusion studies;

(B) simulate the activities of the roles of a healthcare team in performing imaging exams; and

(C) communicate to members of the medical imaging team using appropriate terminology related to imaging modalities.

(6) The student evaluates ethical behavioral standards and legal responsibilities as a radiographer. The student is expected to:

(A) explain legal and ethical behavior standards such as patient Bill of Rights, Advanced Directives, and the Health Insurance Portability and Accountability Act;

(B) describe the legal and ethical ramifications of unethical behavior as applied to medical imaging professionals;

(C) research and describe the role of medical imaging professional associations and regulatory agencies; and

(D) research and apply standards of medical imaging scope of practice to case studies.

(7) The student implements proper imaging technology terminology. The student is expected to:

(A) describe the locations and specific anatomical contents for each of the body regions;

(B) apply correct anatomical positioning and directional terms to exam procedures, including chest, extremities, skull, and spine procedures; and

(C) employ proper usage of medical and radiological imaging technology abbreviations and symbols in verbal and written communication.

(8) The student exhibits an increasing knowledge of the structure of the human body as it is related to various imaging modalities. The student is expected to:

(A) identify external landmarks as applied to proper positioning;

(B) describe the various ways anatomy is presented as viewed from the body planes, including sagittal, coronal, transverse, and oblique views;

(C) differentiate between the body systems radiographically; and

(D) describe and locate internal and external anatomical landmarks as applied to proper alignment of radiologic exams.

(9) The student analyzes the effects of positioning during radiographic exams. The student is expected to:

(A) determine proper positioning for extremities, chest, abdominal and skull series radiographs;

(B) explain how positioning, view, and projection effect the radiographic image; and

(C) compare the relationships between specific anatomical structures and the positioning procedures used to evaluate those structures.

(10) The student identifies and describes the proper use of equipment utilized in radiographic exam rooms. The student is expected to:

(A) identify radiologic exam room equipment to be used during common exams such as extremities, abdominal, chest and skull exams;

(B) identify difference methods of manipulation of the x-ray tube to provide quality images, such as collimator limiting, cross table lateral hips, decubitus, and trauma series;

(C) determine the proper imaging equipment needed based on simulated situations including; standard exams, trauma, and disorders; and

(D) demonstrate appropriate use of radiologic equipment in a simulated setting.

(11) The student describes and applies concepts of radiologic physics. The student is expected to:

(A) identify radiology related SI units;

(B) identify the properties of x-ray photons;

(C) describe and explain the importance of the laws of electrostatics, laws of magnetism, and the inverse square law;

(D) explain the relationship between electron arrangement and ionizing radiation production;

(E) describe elements of electrodynamics, including electric circuits, conductors and insulators, and direct and alternating current;

(F) describe elements of electrostatics, including electrostatic charge, and electric potential;

(G) analyze the process of creating ionizing radiation; and

(H) compare and contrast the different types of ionizing radiation such as characteristic, Bremsstrahlung, and scatter radiation.

(12) The student evaluates an x-ray beam and the factors that affect it. The student is expected to:

(A) identify factors affecting the intensity of the x-ray beam;

(B) define the line-focus principle and the heel effect;

(C) define x-ray quality and penetrability;

(D) describe the five x-ray interactions with matter;

(E) describe the x-ray emission spectrum;

(F) describe radiation quantity and factors that effect it;

(G) differentiate and explain the function of various components of the x-ray tube, including the cathode, anode, glass enclosure, focusing cup, filament, target, window, collimator, and rotating anode;

(H) compare and contrast characteristic and bremsstrahlung radiation;

(I) explain how mAs, kVp, and added filtration affect the x-ray emission spectrum; and

(J) explain the difference between absorption and attenuation of the x-ray beam.

(13) The student describes imaging techniques and their effects on image quality. The student is expected to:

(A) identify and describe different types of grids;

(B) identify exposure factors that improve radiographic quality;

(C) describe the geometric factors that affect image quality, including magnification, distortion, and focal-spot blur;

(D) compare and contrast the use of grids as related to image quality and patient dose;

(E) describe radiographic quality, resolution, noise, and speed;

(F) explain the relationship between image contrast and scatter;

(G) explain how patient factors affect radiographic technique; and

(H) explain image quality factors and how they affect the radiograph, including optical density, contrast, image detail and distortion.

(14) The student explains the significance of radiation protection principles and how to minimize radiation exposure for patients. The student is expected to:

(A) identify radiation protection procedures, such as the use of lead shielding, and explain when to use them;

(B) identify and describe early and late effects of radiation;

(C) identify dose limits for radiation workers and the public;

(D) describe ways of reducing unnecessary patient dose;

(E) describe the concept of dose limits;

(F) compare the cardinal principles of time, distance, and shielding as they relate to patient dosage;

(G) explain the effects of radiation on DNA and other macromolecules;

(H) explain occupational radiation monitors and where they should be positioned;

(I) summarize the concept of "as low as reasonably achievable" (ALARA) and how it is used in the practice of radiographic imaging; and

(J) discuss ways to reduce occupational radiation exposure.

Recommended Resources and Materials:

Campeau, Frances, and Jeana Fleitz. *Limited Radiography*. 4th ed. CENGAGE Learning Custom Publishing, 2016.

FACMP, Stewart C. Bushong ScD FACR. *Radiologic Science for Technologists: Physics, Biology, and Protection*. 11th ed. Mosby, 2016.

---. *Workbook for Radiologic Science for Technologists: Physics, Biology, and Protection*. 11th ed. Mosby, 2017.

FASRT, Bruce W. Long MS RT(CV), Jeannean Hall Rollins MRC BSRT(CV), et al. *Merrill's Atlas of Radiographic Positioning and Procedures - 3-Volume Set*. 14th ed. Mosby, 2019.

FASRT, Bruce W. Long MS RT(CV), Barbara J. Smith MS RT(QM) FASRT FAEIRS, et al. *Workbook for Merrill's Atlas of Radiographic Positioning and Procedures*. 14th ed. Mosby, 2018.

Long, Bruce W., et al. *Radiography Essentials for Limited Practice*. 2016.

PhD, Larry R. Cochard, et al. *Netter's Introduction to Imaging: With Student Consult Access*. 1st ed. Saunders, 2011.

ITEM	TYPE OF RESOURCE	WHERE TO FIND
Anatomage Table	Classroom manipulative	https://www.anatomage.com/table
Anatomy AR+	Interactive 3D anatomy model that works with Merge Cube	https://www.hybridmedicalanimation.com
Anatomy.tv	Digital resource	https://www.anatomy.tv/
ASRT newsroom articles	Scholarly articles Student resources reinforce ELA and critical thinking	https://www.asrt.org/main/news-publications
Cassettes: 17" x 14", 14" x 14", 10" x 12" and 8" x 10"	Classroom resource	https://pixray.com/
Laptop / ipad	Digital resource	
Lead aprons/ shields	Classroom manipulative	https://pixray.com/
Merge cube	Classroom manipulative	https://mergeedu.com/cube
Positioning sponges	Classroom manipulative	https://pixray.com/
Radiology phantoms transparent	Classroom manipulative	https://www.gtsimulators.com/X-Ray-Phantoms-Radiology-Training-Phantoms-and-Simulator-s/208.htm
radtechbootcamp.com	Digital resource	https://www.radtechbootcamp.com/
Treatment table unupholstered	For positioning labs, upholstery can cause misalignment when placing a cassette. It could damage the table.	https://www.tigermedical.com/

Approved for use beginning: 2015-2016

X-ray markers	Classroom manipulative	https://pixray.com/

Recommended Course Activities:

- Simulation positioning lab
  AP (anteroposterior), PA (poster-anterior), lateral, oblique, axial, etc.
- Simulation patient safety lab
- Research and preparation of presentations using computer technology
- Oral presentations
- Anatomical landmark lab and presentation
  Practice identifying for anterior, posterior, superior, inferior, medial, lateral, proximal distal, etc.
- Image quality identification lab
- Vocabulary activities: x-ray, radiograph, SID, CR, landmarks, radiographic image, imaging plate, technique, density, contrast, kVp, mAs, and x-ray field
- Simulation patient care labs
- Labs related to radiation physics: converting units, such as current, voltage, direct current, alternating current, resistance, and different types of circuits
- Tests, assignments, and related supplemental materials
- Gallery walks

Suggested methods for evaluating student outcomes:

- Classroom assignments
- Individual and group projects
- Interviews
- Surveys
- Labs assessments for positioning of chest and lower and upper extremities
- Quizzes
- Mock certification exams over limited content
- Tests
- Final exam

Teacher qualifications:

An assignment for Imaging Technology I is allowed with one of the following certificates.

- Health Science: Grades 6 – 12.
- Health Science Technology Education Certification 8 – 12 with a background in radiology.
- Vocational Health Occupations.
- Vocational Health Science Technology.

The following licensures are also preferred:

- American Registry of Radiologic Technologists (ARRT) certification, and/ or
- Limited Scope Medical Radiologic Technologist License

Additional information: