

Diagnostic Medicine

Primary Career Cluster:	Health Science
Course Contact:	CTE.Standards@tn.gov
Course Code(s):	C14H12
Prerequisite(s):	<i>Health Science Education</i> (C14H14)
Credit:	1
Grade Level:	10-11
Focused Elective Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
POS Concentrator:	This course satisfies one out of two required courses to meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
Programs of Study and Sequence:	This is the second or third course in the <i>Diagnostic Services</i> program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://tn.gov/education/topic/work-based-learning .
Available Student Industry Credentials:	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit https://www.tn.gov/education/career-and-technical-education/student-industry-certification.html
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html Best for All Central: https://bestforall.tnedu.gov/

Course-at-a-Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career & technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals, and use/produce industry specific, informational texts.

Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course, note this is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management
- Participate in contests that highlight job skill demonstration; interviewing skills; community service activities, extemporaneous speaking, and job interview
- Participate in leadership activities such as Organizational Leadership, Prepared Speaking, HOSA Service Project, Creative Problem Solving, and HOSA Service Project.

For more ideas and information, visit Tennessee HOSA at <http://www.tennesseehosa.org/>

Using Work-based Learning in Your Classroom

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standards 1-2** | Interview a diagnostic medicine professional to determine how HIPAA's ethical/legal tenets affect the patient's rights for all aspects of care.
- **Standards 3-8** | Shadow a biomedical equipment technician to explore how diagnostic equipment has developed and to observe quality control monitoring.
- **Standards 9-11** | Invite an infection control specialist to present information on healthcare-associated infections related to diagnostic medicine.
- **Standards 12-16** | Tour an imaging department
- **Standards 17-20** | Tour a medical laboratory program at a local community college
- **Standards 21-24** | Shadow an ophthalmic technician to observe the use of diagnostic equipment.
- **Standards 25-31** | Participate in an abbreviated internship to practice the skills required of an EKG technician.

For more ideas and information, visit <https://www.tn.gov/education/career-and-technical-education/work-based-learning.html>.

Course Description

Diagnostic Medicine is a second or third level course designed to prepare students to pursue careers in the fields of diagnostic medical imaging, medical laboratory testing, optometry, and other patient diagnostic procedures. Upon completion of this course, proficient students will be able to describe new and evolving diagnostic technologies, compare and contrast the features of healthcare systems, explain the legal and ethical ramifications of the healthcare setting, and begin to perform foundational healthcare skills. In addition, students will continue to add artifacts to a portfolio, which they will continue to build throughout the program of study.

Program of Study Application

This is the second or third course in the *Diagnostic Services* programs of study. For more information on the benefits and requirements of implementing these programs in full, please visit the Health Science website at <https://tn.gov/education/article/cte-cluster-health-science>.

Implementation options are as follows:

- Option 1: Diagnostic Medicine taught as a Level Two course
- Option 2: Diagnostic Medicine taught as a Level Three course

Core standards are required for both options above:

Core standards: 1,2,3,4,5,6,7,8,9,10,11,14,15,16,19,20,23,24,25,26,27,28,29,30,31

Additional standards:

Option 1: 12, 17, 21

Option 2: 13, 18, 22

Course Standards

Career Planning and Professionalism

- 1) Revise the career information portfolio developed in the *Health Science Education* course and update with more in-depth information surrounding careers in diagnostic sciences. Identify specific roles and responsibilities for each career in this field. Investigate and compare the range of skills, competencies, and professional traits required for such careers. Compare findings to current individual strengths and identify opportunities for personal development.
- 2) Summarize the Health Insurance Portability and Accountability Act (HIPAA), in particular those aspects related to maintaining confidentiality, patient rights, patient safety, and other ethical/legal directives governing medical treatment. Using medical terminology and accurate definitions of legal concepts, explain how the content of these ethical/legal ramifications affects patients' rights for all aspects of care.

Technology

- 3) Investigate and document the history of diagnostic medical imaging, medical laboratories, and other related areas of diagnostic medicine. Explain how technology, including telemedicine, is influencing the future of each. Synthesize research from professional

journals and other medical or technical literature (noting the authors and their purposes) to analyze the barriers to these technologies and predict how the industry might respond.

- 4) Synthesize information from professional journals and digital resources to investigate the use of robotics in healthcare other than in surgical procedures. Develop a proposal, sketch, mock press release, or similar written artifact for a new technology or an improvement to a current technology that can be used in the field of diagnostics. Detail all the specifications of the new technology, including an explanation of how the technology will be used, the projected cost-saving measures, and the most applicable professions that would use the technology.
- 5) Evaluate data from research articles encompassing the reliability of home testing kits (i.e., pregnancy test) and portable diagnostic equipment (i.e., glucometers). Explain findings in an informational essay, citing at least three different peer-reviewed articles and including appropriate medical terminology.

Safety

- 6) Obtain medical laboratory manuals from at least three different resources or physical laboratory sites. Identify the elements of containment regarding general infection control, chemistry precautions, fire safety, chemical hazards, electrical safety, mechanical safety, general lab safety, accident exposure, and disaster preparedness. Develop a written or digital lab manual for a medical laboratory at school based on findings from the research.
- 7) Research the guidelines pertaining to radiation safety for staff, patients, and family who are receiving any radiological procedure. Develop an informational artifact, public service announcement, or health education presentation that instructs patients/clients on what patients should know about medical radiation safety.
- 8) Explore policies and procedures related to diagnostic equipment quality control monitoring and evaluation. Synthesize information into a digital or written presentation to instruct appropriate staff on the importance of implementing quality control processes according to policy.

Infection Control/Medical Microbiology

- 9) Demonstrate mastery of concepts and skills related to asepsis, Universal Precautions, sanitation, disinfection, and sterilization for patient/client care settings in adherence to standards and guidelines from the Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA) in a lab/clinical setting.
- 10) Define the term normal flora and explain how its deviation can prevent or cause a disease or disorder. Outline specific preventive measures to align to acceptable standards of care in the healthcare field.
- 11) Assess the differences between healthcare-associated infections and non-healthcare-associated infections using examples drawn from mock patient documents or case studies.

Support explanations with relevant surveillance statistics, preventive measures, and methodologies concerning outbreak detection, management, and education.

Diagnostic Medical Imaging

- 12) Outline the in-depth normal structure and function of the musculoskeletal, digestive, and cardio-respiratory systems, specifically as they relate to diagnostic medical imaging. Review directions, planes, and sections of the body in order to perform diagnostic imaging procedures. Summarize appropriate medical text(s) in order to list signs and symptoms of common diseases and disorders associated with each system.
- 13) Outline the bony anatomy and organ structures of the musculoskeletal, digestive, and cardio-respiratory systems as they relate to diagnostic medical imaging. Review directions, planes, and sections of the body in order to perform radiographic images. Summarize appropriate medical text(s) in order to list signs and symptoms associated with and specific diagnostic studies used for common diseases and disorders associated with each system.
- 14) Distinguish between the various types of diagnostic medical imaging, citing the uses, advantages, and disadvantages of each. Develop an explanation that would be used for beginning health science students, incorporating appropriate industry and medical terminology.
- 15) Distinguish between Direct Radiography and Computed Radiography, citing the benefits of each related to the effects of radiation dose and cost. Compare the benefits of image storage in Picture Archive and Communication Systems to x-ray film storage. Relate the benefits of electronic image storage to its application in Telemedicine.
- 16) Research the principles of radiographic physics and explain how the concepts are applied to produce high-quality radiographic images. Discuss the following in the explanation:
 - a. Properties of X-rays
 - b. Production of X-rays
 - c. The X-ray tube and other parts of an X-ray machine
 - d. Absorption, scatter, and transmission of X-rays

Clinical Laboratory

- 17) Outline the in-depth normal structure and function of blood and related components. Summarize appropriate medical text(s) in order to list signs and symptoms of common blood diseases and disorders associated with each. Define the following common laboratory procedures, both normal and abnormal, and provide the reasoning for why the test should be obtained:
 - a. Complete Blood Count
 - b. Complete Metabolic Panel
 - c. Fasting Lipid Panel
 - d. Hgb A1C

- 18) Analyze the relationship of blood components to common blood diseases and disorders listing signs and symptoms associated with each. Define the following common laboratory procedures, both normal and abnormal, and provide the reasoning for why the test should be obtained:
 - a. Complete Blood Count
 - b. Complete Metabolic Panel
 - c. Fasting Lipid Panel
 - d. Hgb A1C

- 19) Develop a graphic organizer or concept map to explain the functions of the various departments of a medical laboratory, such as microbiology, chemistry, hematology, blood banking, and urology. Include types of fluid samples and test that are performed in each area with a detail of the precautions involved when handling each.

- 20) Understand principles of and successfully perform skills of a phlebotomist, incorporating rubrics from National HOSA, textbooks, or clinical standards of practice.
 - a. Distinguish sites and/or veins for blood draws in all populations using the required equipment and safety precautions.
 - b. Perform collection procedures for micro-specimens and venipuncture on a mannequin using appropriate collection containers and identifying factors affecting collection/test results.
 - c. Provide guidelines for obtaining blood from neonates, pediatrics, and geriatrics.
 - d. Perform skills of patient/specimen identification and transporting of specimens.

Ophthalmological Procedures

- 21) Outline the in-depth normal structure and function of the eye. Summarize appropriate medical text(s) in order to list signs and symptoms of common diseases and disorders associated with each.

- 22) Summarize appropriate medical text(s) in order to compare and contrast normal versus abnormal structure and function of the eye related to common eye diseases listing signs and symptoms, and diagnostic studies for each.

- 23) Understand principles of and successfully perform skills related to basic ophthalmic examination, incorporating rubrics from textbooks or clinical standards of practice. Measure pulse and blood pressure, and conduct a history and physical, especially concerning areas related to the eye.

- 24) Research the concepts surrounding measurement of visual acuity with associated equipment, and explain corrective measures for abnormalities (i.e., surgery, glasses, or contacts). Specify what measures should be used with each abnormality.

Cardiologic Services

- 25) Research the educational requirements, certification, and licensures for cardiovascular technologist, diagnostic vascular technologist, electrocardiogram technician, telemetry

technician, cardiac sonographers, and other related cardiovascular careers. Compare and contrast the educational requirements of each.

- 26) Investigate cardiac diagnostic procedures both in-hospital and out-patient and identify the equipment required for these services.
- 27) Create an infographic to identify gross heart anatomy and physiology and related cardiac conduction and circulatory pathways.
- 28) Assess lead placements and correlate their relationship to the conduction system through the use of a diagram or model.
- 29) Analyze the P,Q,R,S,T complex and its correlation to the cardiac cycle. Chart a mock representation of these waves on an electrocardiogram.
- 30) Analyze rhythm strips and/or 12 lead EKGs and differentiate between critical and non-critical cardiac rhythms using student created algorithms.
- 31) Assess and analyze cardiac output and tissue perfusion using capillary refill and/or pulse oximeter by assessing multiple classmates and correctly charting on flow chart.

The following artifacts should be included in the student's portfolio:

- Career exploration artifacts
- Skills performance rubrics
- Documentation of job shadowing hours
- Examples of written, oral, or digital presentations
- Short research project documents

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.
- National Accrediting Agency of Clinical Laboratory Sciences (NAACLS): [Standards for Specific Approved Programs](#)
 - Note: Students must be a completer of a NAACLS approved program in order to sit for a national phlebotomy certification exam.