

# Diagnostic Medicine

<b>Primary Career Cluster:</b>	Health Science
<b>Course Contact:</b>	<a href="mailto:CTE.Standards@tn.gov">CTE.Standards@tn.gov</a>
<b>Course Code(s):</b>	C14H12
<b>Prerequisite(s):</b>	<i>Health Science Education (C14H14)</i>
<b>Credit:</b>	1
<b>Grade Level:</b>	10-11
<b>Focused Elective Graduation Requirements:</b>	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
<b>POS Concentrator:</b>	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.
<b>Programs of Study and Sequence:</b>	This is the third course in the <i>Diagnostic Services</i> program of study.
<b>Aligned Student Organization(s):</b>	HOSA: <a href="http://www.tennesseehosa.org">http://www.tennesseehosa.org</a>
<b>Coordinating Work-Based Learning:</b>	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit <a href="https://www.tn.gov/education/educators/career-and-technical-education/work-based-learning.html">https://www.tn.gov/education/educators/career-and-technical-education/work-based-learning.html</a> .
<b>Available Student Industry Credentials:</b>	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 <a href="https://www.tn.gov/content/tn/education/educators/career-and-technical-education/student-industry-certification.html">https://www.tn.gov/content/tn/education/educators/career-and-technical-education/student-industry-certification.html</a> .
<b>Teacher Endorsement(s):</b>	577, 720
<b>Required Teacher Certifications/Training:</b>	None
<b>Teacher Resources:</b>	<a href="https://www.tn.gov/education/educators/career-and-technical-education/career-clusters/cte-cluster-health-science.html">https://www.tn.gov/education/educators/career-and-technical-education/career-clusters/cte-cluster-health-science.html</a>  Best for All Central: <a href="https://bestforall.tnedu.gov/">https://bestforall.tnedu.gov/</a>

## Course at a Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21<sup>st</sup> 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 and 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 (WBL) 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 1.1-1.2** | Interview a diagnostic medicine professional to determine how HIPAA's ethical/legal tenets affect the patient's rights for all aspects of care.
- **Standards 2.1-3.3** | Shadow a biomedical equipment technician to explore how diagnostic equipment has developed and to observe quality control monitoring.
- **Standards 4.1-4.3** | Invite an infection control specialist to present information on healthcare-associated infections related to diagnostic medicine.
- **Standards 5.1-5.5** | Tour an imaging department
- **Standards 6.1-6.4** | Tour a medical laboratory program at a local community college
- **Standards 7.1-7.4** | Shadow an ophthalmic technician to observe the use of diagnostic equipment.
- **Standards 8.1-8.7** | 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/educators/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.

### 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: **Excludes** standards 5.4, 6.1, 6.4 and 7.1

### Additional standards:

- Option 1: 5.4, 6.4
- Option 2: 6.1, 7.1

## Course Standards

### 1. Career Planning and Professionalism

- 1.1 Diagnostic Careers: Differentiate **diagnostic services careers** from the four other health science career areas. Identify specific **roles and responsibilities** for a variety of careers 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**.
- 1.2 HIPAA: 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.

### 2. Technology

- 2.1 History of Diagnostic Medical Imaging: 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. Analyze the **barriers to these technologies** and predict how the industry might respond.
- 2.2 Use of Robotics: Investigate the use of **robotics in diagnostic medicine**. Correlate robotic technologies with the areas of diagnostic medicine to which they align and explain the **advantages and disadvantages** of using the robotic technologies in these areas.

2.3 Home Test Kits and Medical Equipment: Evaluate the reliability of **home testing kits** (i.e., pregnancy test) and **portable diagnostic equipment** (i.e., glucometers). Support their use by non-medical individuals and their usefulness in day-to-day care.

### 3. Safety

3.1 Laboratory Safety Concepts: 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. Apply concepts drawn from the manuals in a school-based medical laboratory or the health science classroom.

3.2 Radiation Safety: Research the **guidelines pertaining to radiation safety** for staff, patients, and family who are receiving any radiological procedure. Demonstrate the **delivery of information** to patients/clients regarding what they should know about medical radiation safety.

3.3 Diagnostic Equipment Quality Control: Explore **policies and procedures related to diagnostic equipment quality control monitoring** and evaluation. Relate the importance of implementing quality control processes according to policy to **accurate results and patient safety**.

### 4. Infection Control/Medical Microbiology

4.1 Infection Control: 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.

4.2 Normal Flora Homeostasis: Define the term **normal flora** and explain how its **deviation** can prevent or cause a **disease or disorder**. Appraise specific **preventive measures** aligned to acceptable standards of care that maintain normal flora **homeostasis**.

4.3 Epidemiology of Healthcare-Associated Infections: 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**.

## 5. Diagnostic Medical Imaging

- 5.1 Anatomy, Physiology, and Pathophysiology Related to Imaging: Outline the **in-depth normal structure and function of the musculoskeletal, digestive, and cardio-respiratory systems**, specifically as they relate to diagnostic medical imaging. Connect signs and symptoms of common diseases and disorders to each system. Review directions, planes, and sections of the body and their relationships to diagnostic imaging procedures.
- 5.2 Types of Diagnostic Medical Imaging: Distinguish between the various **types of diagnostic medical imaging**, citing the **uses, advantages, and disadvantages** of each. Develop an explanation that would be appropriate for patients/care-givers, incorporating **appropriate medical terminology**.
- 5.3 Direct Versus Computed Radiography and Image Storage: 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**.
- 5.4 Radiographic Physics: 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:
- properties of X-rays;
  - production of X-rays;
  - the X-ray tube and other parts of an X-ray machine; and
  - absorption, scatter, and transmission of X-rays.

## 6. Clinical Laboratory (No Live Sticks)

- 6.1 Anatomy, Physiology, and Pathology of Blood Components and Related Lab Tests: Outline the **in-depth normal structure and function of blood and related components**. Relate signs and symptoms of common blood diseases and disorders to each component. Define the following common laboratory procedures, appraise both normal and abnormal results, and provide the rationale for obtaining the test:
- complete blood count,
  - complete metabolic panel,
  - fasting lipid panel, and
  - Hgb A1C.
- 6.2 Pathophysiology of Blood Components and Related Lab Tests: 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, appraise both normal and abnormal results, and provide the rationale for obtaining the test:
- complete blood count,
  - complete metabolic panel,
  - fasting lipid panel, and
  - Hgb A1C.

- 6.3 Medical Laboratory Departments: 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 tests** that are performed in each area with a detailed explanation of the **precautions** involved when handling each.
- 6.4 Phlebotomy Skills: Understand principles of and successfully perform **skills of a phlebotomist**, incorporating rubrics from National HOSA, textbooks, or clinical standards of practice.
- Distinguish sites and/or veins for blood draws in all populations using the required equipment and safety precautions.
  - Perform collection procedures for micro-specimens and venipuncture on a mannequin using appropriate collection containers and identifying factors affecting collection/test results.
  - Provide guidelines for obtaining blood from neonates, pediatrics, and geriatrics.
  - Perform skills of patient/specimen identification and transporting of specimens.

## 7. Ophthalmological Procedures

- 7.1 Anatomy Physiology, and Pathology of the Eye: Outline the **in-depth normal structure and function of the eye**. Relate signs and symptoms of common diseases and disorders associated with each structure.
- 7.2 Pathology of the Eye and Related Lab Tests: 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**.
- 7.3 Ophthalmic Exam Skills: 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.
- 7.4 Visual Acuity and Abnormalities: Research the concepts surrounding **measurement of visual acuity** with **associated equipment**, and explain **corrective measures for abnormalities** (i.e., surgery, glasses, or contacts). Specify measures that should be used with each abnormality.

## 8. Cardiologic Services

- 8.1 Cardiovascular Careers: 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.
- 8.2 Cardiac Diagnostic Procedures: Investigate **cardiac diagnostic procedures** both in-hospital and out-patient and identify the equipment required for these services.

- 8.3 Heart Anatomy and Physiology Including the Conduction System: Identify **gross heart anatomy and physiology** and **related cardiac conduction and circulatory pathways**.
- 8.4 Lead Placement: Assess **lead placements** and correlate their relationships to the **conduction system** using a diagram or model.
- 8.5 Waves, Complexes and the Cardiac Cycle: 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.
- 8.6 Rhythm Strip Analysis: Analyze **rhythm strips** and/or **12 lead EKGs** and differentiate between **critical and non-critical cardiac rhythms** using student created algorithms.
- 8.7 Cardiac Output Assessment: 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.

## 9. Diagnostic Services Terminology

- 9.1 Diagnostic Services Terminology: Analyze and interpret **medical terminology and abbreviations related to anatomy and physiology, pathology, and diagnostic services**. Demonstrate mastery of medical terminology use and accurate spelling in each area through verbal and written explanation. Demonstrate the skills involved when **communicating with a patient or family member** by explaining the terminology, abbreviations, and symbols in **layman's terms**.

**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; and
- 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.