

**Health Science Career Cluster
Non-Invasive Diagnostic Technology
Course Number: 25.44500**

Course Description:

This course is designed to offer high school students (juniors and seniors) the opportunity to explore and apply non-invasive diagnostic procedures in the field of cardiology, radiology and pulmonology. This course should pique the interest in students to seek certifications and further their education using the knowledge and practical application of non-invasive techniques in the area of cardiology, radiology and pulmonology. The prerequisites for this course are Introduction to Healthcare and Essentials of Healthcare.

The ultimate goal of this course is to prepare students to move into post-secondary education and training and/or to possibly take the EKG assessment potentially resulting in an industry credential after completion of any required clinical experience. Individual states may have regulations that could impact certification what an EKG technician can do in that state.

Course Standard 1

HS-NDT-1

The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept.

Standard: Demonstrate employability skills required by business and industry.

The following elements should be integrated throughout the content of this course.

1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.

Person-to-Person Etiquette	Telephone and Email Etiquette	Cell Phone and Internet Etiquette	Communicating At Work	Listening
Interacting with Your Boss	Telephone Conversations	Using Blogs	Improving Communication Skills	Reasons, Benefits, and Barriers
Interacting with Subordinates	Barriers to Phone conversations	Using Social Media	Effective Oral Communication	Listening Strategies
Interacting with Co-workers	Making and Returning Calls		Effective Written Communication	Ways We Filter What We Hear
Interacting with Suppliers	Making Cold Calls		Effective Nonverbal Skills	Developing a Listening Attitude
	Handling Conference Calls		Effective Word Use	Show You Are Listening
	Handling Unsolicited Calls		Giving and Receiving Feedback	Asking Questions
				Obtaining Feedback
				Getting Others to Listen

Nonverbal Communication	Written Communication	Speaking	Applications and Effective Résumés
Communicating Nonverbally	Writing Documents	Using Language Carefully	Completing a Job Application

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Reading Body Language and mixed Messages	Constructive Criticism in Writing	One-on-One Conversations	Writing a Cover Letter
Matching Verbal and Nonverbal communication		Small Group Communication	Things to Include in a Résumé
Improving Nonverbal Indicators		Large Group Communication	Selling Yourself in a Résumé
Nonverbal Feedback		Making Speeches	Terms to Use in a Résumé
Showing Confidence Nonverbally		Involving the Audience	Describing Your Job Strengths
Showing Assertiveness		Answering Questions	Organizing Your Résumé
		Visual and Media Aids	Writing an Electronic Résumé
		Errors in Presentation	Dressing Up Your Résumé

1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

Teamwork and Problem Solving	Meeting Etiquette
Thinking Creatively	Preparation and Participation in Meetings
Taking Risks	Conducting Two-Person or Large Group Meetings
Building Team Communication	Inviting and Introducing Speakers
	Facilitating Discussions and Closing
	Preparing Visual Aids
	Virtual Meetings

1.3 Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

Problem Solving	Customer Service	The Application Process	Interviewing Skills	Finding the Right Job
Transferable Job Skills	Gaining Trust and Interacting with Customers	Providing Information, Accuracy and Double Checking	Preparing for an Interview	Locating Jobs and Networking
Becoming a Problem Solver	Learning and Giving Customers What They Want	Online Application Process	Questions to Ask in an Interview	Job Shopping Online
Identifying a Problem	Keeping Customers Coming Back	Following Up After Submitting an Application	Things to Include in a Career Portfolio	Job Search Websites
Becoming a Critical Thinker	Seeing the Customer's Point	Effective Résumés:	Traits Employers are Seeking	Participation in Job Fairs
Managing	Selling Yourself and the Company	Matching Your Talents to a Job	Considerations Before Taking a Job	Searching the Classified Ads
	Handling Customer Complaints	When a Résumé Should be Used		Using Employment Agencies
	Strategies for Customer Service			Landing an Internship
				Staying Motivated to Search

1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.

Workplace Ethics	Personal Characteristics	Employer Expectations	Business Etiquette	Communicating at Work
Demonstrating Good Work Ethic	Demonstrating a Good Attitude	Behaviors Employers Expect	Language and Behavior	Handling Anger
Behaving Appropriately	Gaining and Showing Respect	Objectionable Behaviors	Keeping Information Confidential	Dealing with Difficult Coworkers

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Maintaining Honesty	Demonstrating Responsibility	Establishing Credibility	Avoiding Gossip	Dealing with a Difficult Boss
Playing Fair	Showing Dependability	Demonstrating Your Skills	Appropriate Work Email	Dealing with Difficult Customers
Using Ethical Language	Being Courteous	Building Work Relationships	Cell Phone Etiquette	Dealing with Conflict
Showing Responsibility	Gaining Coworkers' Trust		Appropriate Work Texting	
Reducing Harassment	Persevering		Understanding Copyright	
Respecting Diversity	Handling Criticism		Social Networking	
Making Truthfulness a Habit	Showing Professionalism			
Leaving a Job Ethically				

1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.

Expected Work Traits	Teamwork	Time Management
Demonstrating Responsibility	Teamwork Skills	Managing Time
Dealing with Information Overload	Reasons Companies Use Teams	Putting First Things First
Transferable Job Skills	Decisions Teams Make	Juggling Many Priorities
Managing Change	Team Responsibilities	Overcoming Procrastination
Adopting a New Technology	Problems That Affect Teams	Organizing Workspace and Tasks
	Expressing Yourself on a Team	Staying Organized
	Giving and Receiving Constructive Criticism	Finding More Time
		Managing Projects
		Prioritizing Personal and Work Life

1.6 Present a professional image through appearance, behavior and language.

On-the-Job Etiquette	Person-to-Person Etiquette	Communication Etiquette	Presenting Yourself
Using Professional Manners	Meeting Business Acquaintances	Creating a Good Impression	Looking Professional
Introducing People	Meeting People for the First Time	Keeping Phone Calls Professional	Dressing for Success
Appropriate Dress	Showing Politeness	Proper Use of Work Email	Showing a Professional Attitude
Business Meal Functions		Proper Use of Cell Phone	Using Good Posture
Behavior at Work Parties		Proper Use in Texting	Presenting Yourself to Associates
Behavior at Conventions			Accepting Criticism
International Etiquette			Demonstrating Leadership
Cross-Cultural Etiquette			
Working in a Cubicle			

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence L9-10RST 1-10 and L9-10WHST 1-10:

Georgia Standards of Excellence ELA/Literacy standards have been written specifically for technical subjects and have been adopted as part of the official standards for all CTAE courses.

Course Standard 2

HS-NDT-2

Demonstrate a professional demeanor at all times, both in the classroom and within the healthcare facilities.

- 2.1 Demonstrate dependability as it relates to being present, on time, and ready to participate.
- 2.2 Show compassion as it relates to being sensitive to the needs of patients and co-workers.
- 2.3 Exhibit flexibility as it relates to their willingness to adapt to changes, accept added responsibility, and be a team player.
- 2.4 Perform honesty as it relates to willingness to admit mistakes, to get help when unsure of a procedure, and to act in the interest of client safety.
- 2.5 Demonstrate integrity as it relates to client privacy and client confidentiality.
- 2.6 Exhibit proper personal appearance to include appropriate dress code, good personal hygiene, and professional demeanor.
- 2.7 Display the importance of good organizational skills and time management skills including completion of assignments.

Course Standard 3

HS-NDT-3

Investigate professional ethics and legal responsibilities relating to non-invasive testing in the area of radiology, cardiology and pulmonary.

- 3.1 Maintain confidentiality and privacy to include HIPAA regulations.
- 3.2 Explain medico legal concepts as it relates to different non-invasive careers.
- 3.3 Demonstrate adhering to and understanding the personal and professional code of ethics.
- 3.4 Investigate the national professional standards related to Radiology Technologists, EKG Technicians, and Respiratory Therapists, including careers available in each field.
- 3.5 Evaluate how culture and diversity affects the delivery of care.
- 3.6 Examine scope of practice, torts, malpractice, negligence, invasion of privacy, privileged communication, confidentiality and informed consent as it relates to career in non-invasive diagnostic testing.
- 3.7 Discuss and understand the patient's rights to Informed Consent, Advance Directives, Do Not Resuscitate (DNR) orders), and a Living Will.

Course Standard 4

HS-NDT-4

Differentiate the services provided in diagnostic imaging.

- 4.1 Differentiate between the types of diagnostic imaging and the types of medical information each generates, including but not limited to Computer Assisted Tomography (CAT), Magnetic Resonance Imaging (MRI), Positron emissions Tomography (PET), Ultrasound Imaging, Mammography and X-Rays.
- 4.2 Differentiate how the types of diagnostic imaging might be utilized for diagnosis, treatment, and monitoring of a medical condition.

Course Standard 5

HS-NDT-5

Demonstrate proper safety principles relating to Radiology, EKG and Respiratory Technicians.

- 5.1 Demonstrate adhering to radiation protection for patient and personnel, including basic methods of protection: time, distance and shielding.

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- 5.2 Distinguish between the protective devices (engineering controls) and procedures (work practice controls) available to provide proper patient care, including when and how to use the devices.
- 5.3 Demonstrate utilizing radiation-safety principles and guidelines, including ALARA (as low as (is) reasonably achievable) principles and PMD (Personal Monitoring Devices).
- 5.4 Research the importance of governing agencies and roles, including FDA (Food and Drug Administration), OSHA (Occupational Safety and Health Administration), MQSA (Mammography Quality Standards Act), ACR (American College of Radiology), and the NRC (Nuclear Radiation Commission).
- 5.5 Apply proper body mechanics for the safety of the healthcare worker and patients when performing simulated procedures.
- 5.6 Apply the appropriate infection control standards while performing procedures in radiology, cardiology or pulmonary services.

Course Standard 6

HS-NDT-6

Demonstrate an understanding of image acquisition and evaluation.

- 6.1 Differentiate between film screen processing and digital imaging processing.
- 6.2 Explain the importance of image identification in diagnostic imaging and understand the legal considerations (patient data, examination data) if not performed properly.
- 6.3 Identify image quality related to film brightness/density, contrast/gray scale, motion, artifacts, fog, required anatomy, and positioning accuracy.
- 6.4 Investigate the PACS (picture archiving and communication system) system related to diagnostic imaging.
- 6.5 Recognize currently-utilized diagnostic imaging equipment.

Course Standard 7

HS-NDT-7 Electrocardiogram (EKG)

Demonstrate how to properly place leads and operate a 12-lead EKG (electrocardiogram) unit.

The standards related to EKG may be simulated in a lab, however if attempting to be eligible for an EKG assessment exam in a recognized credential, clinical application and other requirements may be necessary.

- 7.1 Demonstrate collecting and documenting patient history, cardiac medication, and information needed for EKG testing.
- 7.1 Demonstrate setting up and verifying the leads recorded on an EKG.
- 7.2 Demonstrate verifying EKG machine paper speed (e.g., 25mm, 50mm) and EKG machine sensitivity (e.g., h, 1, 2).
- 7.3 Inspect the waveforms of a cardiac cycle for symmetry, direction, and amplitude (e.g., P waves, QRS complexes, ST segments, and T waves).
- 7.4 Demonstrate troubleshooting a 12-lead EKG unit.
- 7.5 Demonstrate mounting a completed EKG for a patient's chart and properly uploading a completed EKG to a patient's electronic medical record.
- 7.6 Demonstrate how to maintain EKG equipment and the work environment.
- 7.7 Demonstrate correctly positioning a patient for testing and applying EKG leads in the correct position on the patient.
- 7.8 Apply electrodes on patient and understand how to respond to signs and symptoms of cardiopulmonary compromise.
- 7.9 Demonstrate performing patient vital signs (heart rate, respirations, temperature, blood pressure) and utilizing a pulse oximeter) to monitor patient during procedures.

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- 7.10 Demonstrate informing patients about the purpose of procedure and directions for testing, including EKG (Electrocardiogram) monitoring, Holter monitoring, Stress testing, and Telemetry monitoring.
- 7.11 Differentiate between the care needed for infant, pediatric, adult patients and those with special considerations (e.g., right sided heart, posterior chest, amputations).

Course Standard 8

HS-NDT-8

Demonstrate and explain how EKG grid paper is used, and plot EKG axis.

- 8.1 Calculate a patient's heart rate from the EKG tracing (e.g., 6-second method, R to R, sequencing).
- 8.2 Measure a patient's heart rhythm from the EKG tracing.
- 8.3 Measure a patient's heart conduction from the EKG tracing (e.g., PR-interval, QRS duration and QT-interval).

Course Standard 9

HS-NDT-9

Recognize normal and abnormal patterns in all EKG leads and understand proper procedures that medical professionals utilize in responding to and reporting results.

- 9.1 Identify and resolve artifacts from the EKG tracing (e.g., wandering baseline, somatic, and electrical).
- 9.2 Identify and determine how a medical professional evaluates sinus rhythm and major classifications of arrhythmias from the EKG tracing (sinus, atrial, ventricular, junctional, and heart blocks).
- 9.3 Describe and demonstrate response to potentially life-threatening arrhythmias.
- 9.4 Recognize pacemaker spikes on an EKG tracing.
- 9.5 Identify the major variances to waveforms related to ischemia, injury, or infarction.

Course Standard 10

HS-NDT-10

Apply patient assessment techniques to differentiate the need for non-invasive pulmonary diagnostic testing.

- 10.1 Identify and describe basic cardiopulmonary anatomy and medical terminology for the cardiopulmonary system.
- 10.2 Demonstrate utilizing assessment skills to check vital signs, height and weight, initial impressions of patient, and record patient history.
- 10.3 Apply examinations techniques, including visual examination head to extremities (chest appearance, clubbing, cyanosis, pedal edema, capillary refill, and skin temperature), auscultation of lung and heart sounds, palpitation, and percussion.
- 10.4 Differentiate between normal and abnormal breath sounds.
- 10.5 Recognize various breathing patterns and respiratory effort.
- 10.6 Demonstrate utilizing pulse oximetry as a tool for assessing patient basic oxygen needs and differentiate between normal and abnormal readings.
- 10.7 Observe a medical professional utilizing chest radiography to recognize normal and abnormal chest findings and apply a systematic approach to reading the chest radiography as an important diagnostic tool.

Course Standard 11

HS-NDT-11

Differentiate between the types and the need for pulmonary non-invasive diagnostic testing. (Simulation in the lab or observations in a clinical setting)

- 11.1 Describe the basic types of pulmonary non-invasive diagnostic testing (chest X-ray, peak flow meters, basic pulmonary function test (spirometry).
- 11.2 Identify and describe the lung volumes and capacities of the averaged size adult.
- 11.3 Differentiate between the use of peak flow meters and basic pulmonary function testing (simple spirometry).
- 11.4 Observe a medical professional teaching proper peak flow technique, performing a peak flow test, and appropriately interpreting information.
- 11.5 Properly calibrate and set up spirometer and discuss the limitations of basic spirometry and the need for more advance pulmonary function testing. Observe as a medical professional interprets basic spirometer results.
- 11.6 Apply principles of infection control to prevent cross contamination of patients when using simple pulmonary function testing.
- 11.7 Differentiate between restrictive and obstructive pulmonary disease based on the expected pulmonary functions results.
- 11.8 Discuss contraindications to pulmonary diagnostic testing.

Course Standard 12

HS-NDT-12

Research careers and certification available in careers that utilize non-invasive diagnostic techniques in fields of radiology, cardiology and pulmonary.

- 12.1 Research career opportunities in fields that utilize non-invasive diagnostic techniques in radiology/imaging, cardiology and pulmonary.
- 12.2 Investigate certifications and further education available for proficiency in using non-invasive diagnostic testing.
- 12.3 Analyze the trends and advantages in the hiring multi-skilled medical workers.

Course Standard 13

HS-NDT-13

Complete a CPR Basic Life Support and first aid course.

- 13.1 Successfully complete Basic Life Support CPR course by a recognized agency, such as the American Heart Association or American Red Cross.
- 13.2 Successfully complete a First Aid course by a recognized agency, such as the American Heart Association or American Red Cross.