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

<table>
<thead>
<tr>
<th>Teamwork and Problem Solving</th>
<th>Meeting Etiquette</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinking Creatively</td>
<td>Preparation and Participation in Meetings</td>
</tr>
<tr>
<td>Taking Risks</td>
<td>Conducting Two-Person or Large Group Meetings</td>
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<tr>
<td>Building Team Communication</td>
<td>Inviting and Introducing Speakers</td>
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<td>Facilitating Discussions and Closing</td>
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<td>Preparing Visual Aids</td>
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<td>Virtual Meetings</td>
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</table>

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

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

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

<table>
<thead>
<tr>
<th>Workplace Ethics</th>
<th>Personal Characteristics</th>
<th>Employer Expectations</th>
<th>Business Etiquette</th>
<th>Communicating at Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrating Good Work Ethic</td>
<td>Demonstrating a Good Attitude</td>
<td>Behaviors Employers Expect</td>
<td>Language and Behavior</td>
<td>Handling Anger</td>
</tr>
<tr>
<td>Behaving Appropriately</td>
<td>Gaining and Showing Respect</td>
<td>Objectionable Behaviors</td>
<td>Keeping Information Confidential</td>
<td>Dealing with Difficult Coworkers</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Expected Work Traits</th>
<th>Teamwork</th>
<th>Time Management</th>
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</thead>
<tbody>
<tr>
<td>Demonstrating Respectability</td>
<td>Teamwork Skills</td>
<td>Managing Time</td>
</tr>
<tr>
<td>Dealing with Information Overload</td>
<td>Reasons Companies Use Teams</td>
<td>Putting First Things First</td>
</tr>
<tr>
<td>Transferable Job Skills</td>
<td>Decisions Teams Make</td>
<td>Juggling Many Priorities</td>
</tr>
<tr>
<td>Managing Change</td>
<td>Team Responsibilities</td>
<td>Overcoming Procrastination</td>
</tr>
<tr>
<td>Adopting a New Technology</td>
<td>Problems That Affect Teams</td>
<td>Organizing Workspace and Tasks</td>
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<tr>
<td>Expressing Yourself on a Team</td>
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<tr>
<td>Giving and Receiving Constructive Criticism</td>
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</table>

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

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

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.
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.

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**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.

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**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.

7.2 Demonstrate setting up and verifying the leads recorded on an EKG.

7.3 Demonstrate verifying EKG machine paper speed (e.g., 25mm, 50mm) and EKG machine sensitivity (e.g., h, 1, 2).

7.4 Inspect the waveforms of a cardiac cycle for symmetry, direction, and amplitude (e.g., P waves, QRS complexes, ST segments, and T waves).

7.5 Demonstrate how to maintain EKG equipment and the work environment.

7.6 Demonstrate correctly positioning a patient for testing and applying EKG leads in the correct position on the patient.

7.7 Apply electrodes on patient and understand how to respond to signs and symptoms of cardiopulmonary compromise.

7.8 Demonstrate performing patient vital signs (heart rate, respirations, temperature, blood pressure) and utilizing a pulse oximeter to monitor patient during procedures.
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.