AATA 103A: ULTRASONIC TESTING LEVEL 1

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2023
Units:	3
Hours:	40 lecture per quarter (40 total per quarter)
Prerequisite:	This course is limited to students admitted to the Nondestructive Testing Technician Apprenticeship Program.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Pass/No Pass Only
Repeatability:	Not Repeatable

Description

This course introduces the basic principles of ultrasonics and prepares the student for straight beam inspections and thickness measurement.

Course Objectives

The student will be able to:

a. Select equipment to conduct test
b. Follow instructions to conduct UT Level 1 inspections
c. Follow step-by-step written calibration procedure
d. Understand all applicable industry codes and standards
e. Interpret results with respect to applicable codes and standards
f. Understand limitation of the test method
g. Write test reports
h. Conduct thickness testing on various reference materials

Course Content

a. Personnel certification
    i. ASNT SNT-TC-1A, 2021
    ii. NAS 410
    iii. Training, experience and examination requirements
    iv. Training requirements
    v. Certification of NDT Personnel: Level I, Level II and Level III
    vi. Recommended course outlines for NDT training
    vii. Required training hours
    viii. Practical
    ix. Quizzes and examinations
b. Wave Modes
    i. Waves - velocity, wavelength, and frequency
    ii. Wave modes: Longitudinal and shear waves
    iii. Velocity of waves
    iv. Factors affecting velocity - temperature
c. Ultrasonic transducer and sound field
    i. Piezoelectric crystal
    ii. Near field concept
    iii. Beam spread and sound loss
    iv. Reducing beam spread: Frequency and diameter
    v. Single and dual transducers
    vi. Resolution in flaw detection: Frequency and damping
    vii. Transducer selection: Frequency and diameter
d. UT equipment
    i. Pulser-Receivers
    ii. Instrument controls: Gain, range, velocity, delay
    iii. Displays, A-, B-, and C-scans
    iv. Selection of UT equipment for ultrasonic testing
    v. UT equipment demonstration
e. Thickness measurement
    i. Thickness measurement concept
    ii. Probe selection: Single vs. dual
    iii. Setting the UT equipment for thickness measurement
    iv. Thickness measurement practical
f. Sound attenuation and decibels
    i. Attenuation - loss of sound with distance
    ii. Maximum range of inspection
    iii. What are decibels (dB)?
    iv. Reducing attenuation - ultrasonic frequency
    v. Attenuation and its effects on testing of materials
    vi. Attenuation and probe selection
g. Acoustic impedance
    i. Reflection and transmission at interfaces
    ii. Impedance matching
h. Refraction and reflection
    i. Reflection and refraction at interfaces
    ii. Snell's Law
    iii. Mode conversion to shear waves at interfaces
    iv. Introduction to angle beam testing of welds (covered in detail in UT Level 2 course)
i. Flaw detection - straight beam
    i. Flaw detection, lamination, corrosion mapping, bolts
    ii. Use of flat bottom holes for establishing reference
    iii. Compensating sound loss from beam spread distance amplitude correction curves (DAC)
    iv. Inspection of forgings and castings: ASTM standards

Lab Content

Not applicable.

Special Facilities and/or Equipment

1. UT thickness machine, transducers, test/sample pieces, couplant.
2. When taught via Foothill Global Access, on-going access to computer with email software and hardware; email address.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Results of written test

Results of practical test

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Discussion
Slideshow
Video
Demonstration
Hands-on training

Representative Text(s) and Other Materials

American Society for Nondestructive Testing. Personnel Training Publications: Ultrasonic Testing (UT) Classroom Training Book. 2015.

This text is still widely used within the industry and is the most current text used for training.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

a. Reading: Read Chapter 4 - UT Equipment
b. Writing: Complete Quiz 4 on page 82. Quiz results will be reviewed in class as a group

Discipline(s)

Industrial Maintenance