



**COWLEY COLLEGE
& Area Vocational Technical School**

COURSE PROCEDURE FOR

**ULTRASONICS TESTING III
NDT3463 3 Credit Hours**

Student Level:

This course is open to students on the college level in either the freshman or sophomore year and to high school vocational students.

Catalog Description:

NDT 3463 - ULTRASONIC TESTING III (3 hrs)

This course is devised to give the student advanced hands-on experience, with practical application in the ultrasonic method. The course is designed to meet certain Nondestructive Testing requirements to prepare the student for a position in the field of ultrasonic inspection.

Prerequisites:

NDT3462 Ultrasonic testing II

Controlling Purpose:

This course is designed to impart the applications of ultrasonic testing, its applications, techniques, process controls such that the student could pass a typical industrial practical certification.

Learner Outcomes:

Upon completion of this course the student will be able to:

1. Calculate and perform process control tests.
2. Perform specific inspection techniques, contact and immersion.
3. Demonstrate the correct test technique for location of a specified defect.
4. Perform ultrasonic inspections report the results as required by an assigned code or standard.
5. Pass a qualification examination 80% or better (practical prepared in accordance with the industry standards).
6. Apply safety attitudes and procedures associated with Ultrasonic Testing.

The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

Units Outcomes and Criterion Based Evaluation Key for Core Content:

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.
- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student’s achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

UNIT 1: Compressional And Shear Wave Inspections						
Outcomes: Upon completion of this unit, the student will be able to successfully demonstrate the application of ultrasonic compressional and shear wave inspections.						
A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Calculate thickness of ten parts using a flaw detector and thickness gauge
						Demonstrate location of twelve defects in six weld plates using shear waves.
						Demonstrate the use of frequency changes as it relates to changes in material structure with compressional and shear waves on five material types.

UNIT 2: Distance Amplitude Settings Using Compressional Waves

Outcomes: Upon completion of this unit, the student will be able to successfully calibrate and perform inspections using a DAC curve and compressional waves.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Create three manual DAC curves using distance amplitude blocks in immersion inspection.
						Create three manual DAC curves using distance amplitude blocks in contact inspection.
						Create two electric DAC curves as required by API and ASME shear wave inspection.
						Calculate the DB difference for signals generated when a manual DAC has been created on an instrument.
						Demonstrate with a DAC the effects of frequency on signal amplitude.

UNIT 3: Material Conditions And Sound Propagation

Outcomes: Upon completion of this unit, the student will be able to successfully demonstrate the effects of material on sound propagation.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Use three materials to perform thickness inspections. When complete, construct a chart showing return signal amplitude as it relates to material structure and surface condition from those materials.
						Give ten materials listed in descending order the ability to successfully propagate sound.
						List and describe five materials used as couplants, demonstrate the advantages and disadvantages of them.

UNIT 4: Ultrasonic Transducer

Outcomes: Upon completion of this unit, the student will be able to successfully demonstrate the selection and use of ultrasonic transducer.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						List five materials that would be suitable, describe the proper frequency, and diameter of transducer needed to locate a defect 0.060 in size.
						List the material that is preferred for the sending crystal; describe why this material is preferred over others.
						List the material that is preferred for the receiving crystal; describe why this material is preferred over others.
						Demonstrate how the size of a transducer will cause defects to go undetected using a pulse echo method.
						Inspect five composite material samples using two delay line transducers.
						Inspect five material samples using dual element transducers.
						Demonstrate using through transmission the ability of a transducer to not detect a defect because of "sound wrapping" in composite materials.
						Demonstrate the loss of defect signal in the near field using two contact transducers.

UNIT 5: Ultrasonic Transducers Immersion And Contact

Outcomes: Upon completion of this unit, the student will be able to successfully select the correct transducer for a given inspection.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Calculate the focal point and choose the correct transducer for location of defects at given depths in five samples.
						Calculate the correct angle for shear wave inspection on five samples using immersion inspection.
						Calculate the correct angle and inspect five butt weld samples.
						Demonstrate location of defects in composite and bonded materials using the through (immersion and contact) transmission method of inspection on four parts.

UNIT 6: Test Calibration And Standardization

Outcomes: Upon completion of this unit, the student will be able to successfully calibrate ultrasonic instruments.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Use the IIW block and D1.1 codebook to calibrate two ultrasonic instruments to code requirements.
						Use ASME Section V, and API 1104, to calibrate two ultrasonic instruments to requirements of the code.
						Use two instruments to locate three resolution holes using shear wave mode of inspection.
						Calibrate two thickness gauges to measure thickness of three given materials with .005" accuracy.
						Check horizontal and vertical leaner on two instruments using the area and distance amplitude blocks.

UNIT 7: Test Parameters In Inspections

Outcomes: Upon completion of this unit, the student will be able to successfully operate the instrument eliminating variables that would interfere with the inspection.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						List and describe shear wave test indicators found on the A-scan display when given three weld plates.
						Demonstrate and describe location of defects in compressional wave testing. Create a technique card describing the set-up.

UNIT 8: Resonance Inspection

Outcomes: Upon completion of this unit, the student will be able to successfully perform resonance inspections using the Bondascope and the Bondmaster instruments.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Demonstrate location of bond line defects using the Bondascope.
						Demonstrate location of bond line defects using the Bondmaster. Create a technique card for the inspection.
						Explain the principals of resonance testing.
						List and describe principals of Mechanical impedance inspections (MIA)
						Demonstrate location of de-laminations in composite materials using MIA inspection.

UNIT 9: Interpretation And Reporting Of Inspections

Outcomes: Upon completion of this unit, the student will be able to successfully locate, evaluate and report indications found when inspecting.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Calculate locations of defects in ten materials create a report for defects located.
						Classify defects using return signal indications found in ten samples using shear wave contact, or immersion inspections. Create an ultrasonic report.

Projects Required:

As assigned

Textbook:

Contact Bookstore for current textbook.

Materials/Equipment Required:

None

Attendance Policy:

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

Grading Policy:

The grading policy will be outlined by the instructor in the course syllabus.

Maximum class size:

Based on classroom occupancy

Course Timeframe:

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

Refer to the following policies:

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

Disability Services Program:

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability, which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.