



**COWLEY COLLEGE
& Area Vocational Technical School**

COURSE PROCEDURE FOR

**ULTRASONIC TESTING I
NDT3461 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 3461 - ULTRASONIC TESTING I (3 hrs)

This course is devised to give the student a complete introduction through hands-on experience in the ultrasonic method within the field of nondestructive testing. The course is designed to meet certain Nondestructive Level I requirements in accordance with A.S.N.T., SNT-TC-1A, & NAS-410.

Prerequisites:

INR3716 Technical Mathematics or instructor approval.

Controlling Purpose:

This course is designed to impart the fundamentals of ultrasonic testing; it's applications, techniques, process controls and the terminology such that the student could pass a typical industrial certification examination in accordance with A.S.N.T. SNT-TC-1A or NAS-410.

Learner Outcomes:

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

1. Perform and interpret standard process control tests.
2. Differences between the specific techniques.
3. Determine test requirements for a specific component.
4. Perform a given ultrasonic inspection correctly and to interpret and report the results.
5. Pass a qualification examination (theory and practical prepared in accordance with the industry standards. SNT TC-1A & NAS-410)
6. Correctly apply safety attitudes and procedures associated with ultrasonic testing that will insure a safe work place environment.

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

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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: History Of Ultrasonics						
Outcomes: Upon completion of this unit, the students will know the background and history of ultrasonics.						
A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Explain the beginning of ultrasonic inspection in Russia.
						Describe the advancements made by Dr. Firestone.
						Describe the advancements made possible by the computer.

UNIT 2: Fundamental Properties Of Sound

Outcomes: Upon completion of this unit, the students will be able to successfully list, describe and calculate sound movement in materials.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Snell's law calculations and predict sound travel in a material.
						Calculate angles of insistence or refraction in given materials and one angle.
						Given velocity and density, calculate acoustic impedence.
						Calculate energy loss in a given material.
						Calculate beam spread in a material.

UNIT 3: Principles Of Wave Propagation

Outcomes: Upon completion of this unit, the students will be able to successfully generate answers to calculations describing wave propagation.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe wave propagation in a media.
						Describe wave propagation as it travels as a surface wave.
						Describe wave propagation as it travels as a plate wave.
						Explain the difference in wave modes, and list one advantage of using each mode.

UNIT 4: Generation Of Ultrasonic Waves

Outcomes: Upon completion of this unit, the students will be able to successfully describe the generation of ultrasonic waves.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Illustrate in a block diagram an ultrasonic instrument.
						Define the piezoelectric effect.
						Calculate the energy difference between two signals.
						List and describe three materials that are not good propagators of sound waves.

UNIT 5: Ultrasonic Testing Contact Methods

Outcomes: Upon completion of this unit, the students will be able to successfully perform contact inspections.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Calibrate an ultrasonic unit given a test block and range using compressional wave mode.
						Locate and explain defects found in test materials using compressional waves.

UNIT 6: Ultrasonic Testing Immersion Methods

Outcomes: Upon completion of this unit, the students will be able to successfully perform immersion inspections.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Calculate the amount of water path necessary for a given inspection.
						Locate and explain defects found in test samples.
						Demonstrate the ability to set-up an immersion inspection.

UNIT 7: Ultrasonic Test Equipment

Outcomes: Upon completion of this unit, the students will be able to successfully perform calibrations on two or more ultrasonic instruments.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Operate two flaw detectors to accurately determine thickness of materials.
						Operate two thickness gauges to accurately determine thickness of the material.

UNIT 8: Selection Of Test Parameters

Outcomes: Upon completion of this unit, the students 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:
						Examine two materials demonstrating variables that were suppressed using pulsar and receiver controls.
						Calculate and demonstrate the variables that change when the material changes from metal to epoxy composite.

UNIT 9: Test Calibration And Standardization

Outcomes: Upon completion of this unit, the students will be able to successfully calibrate and standardize two ultrasonic instruments.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Apply calculations and produce a DAC on two instruments.
						Apply calculations and demonstrate use of area amplitude blocks.
						Demonstrate the ability to set-up a ten inch shear wave screen.

UNIT 10: Variables Affecting Test Results

Outcomes: Upon completion of this unit, the students will be able to successfully list and describe variables affecting an ultrasonic inspection.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						List and describe five variables that could affect a shear wave inspection results.
						List and describe five variables that could affect a compressional wave inspection results.

UNIT 11: Interpretation Of Ultrasonic Indications

Outcomes: Upon completion of this unit, the students will be able to successfully locate and evaluate indications found when inspecting with compressional waves.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Calculate location, and classify all defects found in two samples.
						Examine five samples and demonstrate location of defects.

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.