



**COWLEY COLLEGE
& Area Vocational Technical School**

COURSE PROCEDURE FOR

<p>Phased Array Level I NDT3471 3 Credit Hours</p>
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Student Level:

This course is open to students on the college level in the Nondestructive Testing program that have previously completed as a minimum: Level II Ultrasonic Testing training at this institution or another accepted training institution.

Catalog Description:

NDT3471 – PHASED ARRAY LEVEL I (3 hrs)

This course is designed to help the student increase their knowledge concerning the basic operation and theory of phased array ultrasonics while building on their previous knowledge that has been gained throughout their experience as Ultrasonic Level I and II students and technicians.

Prerequisites:

NDT3461 – Ultrasonic Testing Level I or acceptable equivalent and NDT3462 – Ultrasonic Testing Level II or acceptable equivalent.

Controlling Purpose:

This course is designed to help the student increase the student’s knowledge concerning the basic operation and theory of phased array ultrasonics while building on their previous knowledge that has been gained throughout their experience as Ultrasonic level I and II students and technicians.

Learner Outcomes:

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

1. Compare and Contrast phased array ultrasonics to standard ultrasonics
2. Differentiate phased array equipment from standard ultrasonic equipment
3. Perform basic calibrations using phased array equipment
4. Properly collect and interpret data received using phased array equipment
5. Differentiate and select the proper probe for weld inspection or aircraft inspection
6. Safely collect and interpret data received from the phased array equipment

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: Review of basic ultrasonic theory and applications

Outcomes: Upon completion of this unit, the student will be able to successfully explain basic ultrasonic theory, as well as perform basic ultrasonic inspections using both compression and shear waves.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Describe the three types of scans used in ultrasonic equipment
						2. Describe material effects on the various forms of sound beams
						3. Perform compressional thickness measurements
						4. Perform compressional lamination scans
						5. Perform shear wave calibrations and weld scans
						6. Perform thickness measurements using a dual element thickness gauge

UNIT 2: Comparison of standard ultrasonics to phased array

Outcomes: Upon completion of this unit the student will be able to successfully compare and contrast basic ultrasonics to phased array ultrasonics

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Define the basic phased array terminology
						2. Describe the history of phased array
						3. List and describe the certification structure of phased array
						4. Describe the linear array
						5. Describe the basics of phased array wave formation
						6. Describe the delays applied to the phased array probe elements

UNIT 3: Equipment used in phased array

Outcomes: Upon completion of this unit, the student will be able to successfully identify equipment and software used in phased array.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Explain how focal laws are generated
						2. Describe the block diagrams of how phased array units operate
						3. Explain the differences between phased array probes and wedges
						4. Describe the differences between phased array wedges
						5. Compare and contrast the different types of phased array scans

UNIT 4: Calibrations performed using phased array

Outcomes: Upon completion of this unit, the student will be able to successfully describe the calibrations used within phased array inspections

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Describe the active element and probe verification
						2. Describe the wedge delay and velocity calibration
						3. Describe the exit point and refraction angle calibration
						4. Describe the sensitivity and DAC calibration
						5. Describe beam steering calibrations

UNIT 5: Data Collection Techniques

Outcomes: Upon completion of this unit the student will be able to successfully compare and contrast the different forms of data collection techniques.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Describe differences between A, B, and C scans
						2. List the differences between line and raster scans
						3. Explain “zone discrimination”
						4. Explain the importance of scan plans
						5. Describe the differences between linear and sector scans
						6. Interpret data using probe offsets and indexing

UNIT 6: Data presentations in phased array

Outcomes: Upon completion of this unit the student will be able differentiate the different forms of data presentations used in phased array inspections

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Evaluate the data received from an A scan
						2. Evaluate the data received from a B scan
						3. Evaluate the data received from a C scan
						4. Evaluate the data received from a D scan

UNIT 7: Data evaluation in phased array

Outcomes: Upon completion of this unit the student will be able to successfully discuss and arrange the data that is received from the phased array inspection.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Compare the codes and standards used in phased array testing
						2. Explain how flaws are characterized using phased array
						3. Explain how the geometry of a part varies the data received
						4. Identify data that has been received using a gate
						5. Report the data received from a phased array unit

UNIT 8: Procedures within phased array (Applications)

Outcomes: Upon completion of this unit the student will be able to successfully explain the different procedures used within phased array testing.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						1. Compare and contrast different applications of phased array
						2. Identify scans and signals received from different metallic structures
						3. Explain the limitations of the different forms of phased array scans
						4. Explain the importance of calibration to IIW blocks for weld inspection
						5. Review scans received from different phased array inspections

Projects Required:

As assigned in the course, laboratory assignments will be distributed throughout the course.

Textbook:

Contact Bookstore for current textbook.

Materials/Equipment Required:**Scientific Calculator****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.