ISET-2140: NON-DESTRUCTIVE TESTING

Cuyahoga Community College

Viewing: ISET-2140 : Non-Destructive Testing

Board of Trustees:
January 2023

Academic Term:
Fall 2023

Subject Code
ISET - Integrated Systems Engineering

Course Number:
2140

Title:
Non-Destructive Testing

Catalog Description:
An introduction to terms, definitions, methods, and applications of the non-destructive testing profession and an in-depth exploration of two methods of non-destructive testing: visual inspection and liquid penetrant examination. The tools, proper processing techniques, different testing methods, and interpretation involved with visual inspection and liquid penetrant testing will be discussed and practiced.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
None.

Outcomes

Course Outcome(s):
Describe the different methods of non-destructive testing.

Objective(s):
1. Discuss the history of non-destructive testing.
2. Discuss the fundamentals of visual inspection, liquid penetrant, magnetic particle, radiographic, and ultrasonic testing theory and techniques.

Course Outcome(s):
Use visual inspection techniques and tools to perform visual inspections.

Objective(s):
1. Discuss the physics of light as applied to visual testing.
2. Demonstrate proper visual testing techniques.
3. Practice proper evaluation of visual inspection indications.

Course Outcome(s):
Use liquid penetrants to inspect welds, castings, forgings, and machined components.

Objective(s):

1. Discuss the physics of liquids as applied to liquid penetrant testing.
2. Demonstrate proper liquid penetrant testing techniques.
3. Practice proper evaluation of indications with liquid penetrant techniques.

Methods of Evaluation:

a. Homework assignments
b. Written and verbal quizzes covering testing theory
c. Demonstration of proper testing techniques
d. Written Exams

Course Content Outline:

a. Concepts
    i. Introduction to (NDT) non-destructive testing techniques:
        1. Introduction and history of NDT
        2. NDT in the industry today
        3. Types of NDT
            a. Visual inspection
            b. Liquid Techniques
            c. Magnetic Particle
            d. Radiograph testing
            e. Ultrasonic Testing
    ii. Visual techniques
        1. Introduction
        2. Safety
        3. History of visual techniques
        4. Basic physics of light
        5. The eye
        6. Sensitivity to color
        7. Color blindness/effect on NDT
        8. Visual Acuity testing
        9. Manufacturing processes and visual defects
        10. Weld symbols
        11. Direct and indirect inspection
    iii. Liquid Penetrant
        1. Introduction
        2. Safety
        3. History of penetrant techniques
        4. Basic physics of fluids
        5. Capillary action
        6. Surface tension
        7. Wetting ability
        8. Reliability of detection of defects
        9. Defects must be open to the surface to be detected
        10. The eye
        11. Sensitivity to color
        12. Color blindness/effect on NDT
        13. Visual Acuity testing
        14. Colors used in Penetrant Testing
        15. Manufacturing processes that affect performance of penetrant
        16. Grinding
        17. Sanding
        18. Sandblasting
        19. Oily contaminates
        20. Welding contaminates

21. Welding processes
22. Other contaminates
23. Etching
24. Safety
25. Materials and suitable reagents

b. Skills
   i. Visual testing
      1. Measuring light output
      2. Inspection tools
      3. Weld symbols applied to inspection
      4. Inspection techniques
   ii. Liquid Penetrant
      1. Pre-Cleaning parts
      2. Detrimental materials
      3. Types of penetrant
      4. Testing Methods
      5. Penetrant material testing
      6. Manufacturers certifications
      7. In-use material testing
      8. Process controls Visible Dye
      9. Process controls Fluorescent
      10. Test panel
      11. Penetrant and part temperature
      12. Additional controls for Emulsifiers
      13. Penetrant Application
      14. Capillary Action
      15. Penetrant Dwell
      16. Penetrant Methods and Removal
      17. Surface Drying
      18. Capillary Action
      19. Developer
      20. Inspection

c. Issues
   i. Visual testing
      1. Relevant indications
      2. Non-relevant indications
      3. Measuring indications
      4. Discontinuity vs. Defect
      5. Acceptance Criteria
   ii. Liquid Penetrant
      1. Relevant indications
      2. Non-relevant indications
      3. Swabbing
      4. Re-developing
      5. Measuring indications
      6. White light evaluation
      7. Discontinuity vs. Defect
      8. Acceptance Criteria
      9. Post cleaning

Resources

Patrick Moore. *Nondestructive Testing Handbook: volume 10*. 3. American Society for Nondestructive Testing, 2019.

Patrick Moore. *Nondestructive Testing Handbook: Volume 9*. 3. American Society for Nondestructive Testing, 2020.

Chuck Hellier. *Handbook of Nondestructive Evaluation*. 2. American Society for Nondestructive Testing, 2021.

Noel Tracy, Patrick Moore. *Nondestructive Testing Handbook: volume 2.* 3. American Society for Nondestructive Testing, 1999.

ASNT. *Relevant Discontinuities: Magnetic Particle and Liquid Penetrant Testing.* American Society for Nondestructive Testing, 2010.

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