Introduction to Film Interpretation of Weldments

PEIMS Code: N1303687
Abbreviation: INTFMWLD
Grade Level(s): 10–12
Award of Credit: 1.0

State Approved Innovative Course

- Districts must have local board approval to implement innovative courses.
- In accordance with Texas Administrative Code (TAC) §74.27, school districts must provide instruction in all essential knowledge and skills identified in this innovative course.
- Innovative courses may only satisfy elective credit toward graduation requirements.
- Please refer to TAC §74.13 for guidance on endorsements.

Course Description:

Introduction to Film Interpretation of Weldments provides an overview of non-destructive testing (NDT) principles. It includes coverage of the inspection process, systems, measurements, theories and practices. Students will identify terminology and fundamental concepts of film interpretation of weldments; describe the trends of NDT careers within the industry cluster; identify safety, health, environmental, and ergonomic issues in non-destructive testing; discuss quality and continuous improvement methods; describe the importance of maintenance and inspection within manufacturing; and identify processes and production steps in manufacturing.

Essential Knowledge and Skills:

(a) General requirements. This course is recommended for students in Grades 10–12. Recommended prerequisites: Algebra I. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) In Film Interpretation of Weldments, students will gain knowledge and skills in non-destructive testing (NDT) principles. Instruction includes coverage of the NDT processes, control systems, processes and evaluation theory. Students will identify terminology and fundamental concepts of NDT; describe the trends of NDT careers within the industry cluster; identify safety, health, environmental, and

ergonomic issues in NDT; discuss quality and continuous improvement methods; describe the importance of maintenance and inspection within manufacturing; and identify potential flaws in the processes and production steps in manufacturing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and Skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) discuss and describe the roles, responsibilities, and dynamics of teams as applied in manufacturing careers;

(B) explain employers' work expectations;

(C) demonstrate knowledge of the concepts and skills related to health and safety regulations in the workplace as specified by appropriate governmental entities such as the Occupational Safety and Health Administration (OSHA);

(D) research and describe the trends of non-destructive testing (NDT) careers within the industry; and

(E) identify safety, health, environmental and ergonomic issues in non-destructive testing.

(2) The student identifies terminology and fundamental concepts of NDT of film weldments in manufacturing. The student is expected to:

(A) read and interpret various types of radiation;

(B) measure and identify the various sources of radiation; and

(C) read and interpret radiation measures utilized in producing images.

(3) The student demonstrates understanding of the characteristics of radiography of weldments. The student is expected to:

(A) identify and describe situations in which radiographic imaging is appropriate to use;

(B) investigate applications of radiographic imaging as a testing and imaging system; and

(C) compare the advantages and disadvantages of using radiographic imaging systems.

(4) The student applies mathematical calculations to determine when radiography is the preferred method of non-destructive examination. The student is expected to:

(A) discuss and describe the discovery of radiation and radioactive materials, and their historical uses;

(B) identify and describe the types and sources of radiation;

(C) demonstrate knowledge of and provide examples of industrial radiography uses;

(D) demonstrate knowledge of and explain radiation protection methods;

(E) using mathematical formulas calculate fundamental properties of matter (atom, elements, molecules, compounds);

(F) calculate atomic structure and weight;

(G) solve and explain isotopes;

(H) define and explain radioisotopes; and

(I) research and describe the dynamics of stable versus unstable atoms.

(5) The student applies an understanding of radiographic film: composition, proper handling and storage. The student is expected to:

(A) demonstrate knowledge of and describe radiograph film: composition, proper handling, and storage;

(B) read and interpret film images in a general context (degree of penetration, shape recognition, light and dark regions, light source, etc.);

(C) explain discontinuities, such as slag, porosity, cracks, incomplete fusion, and laminates;

(D) identify weldment types and configurations from films;

(E) read and interpret radiograph films; and

(F) identify and interpret discontinuities leading to weld failure.

(6) The student applies an understanding of the reading and interpreting of film images in a general context. The student is expected to:

(A) describe and interpret the degree of penetration;

(B) explain and define X and Gamma rays;

(C) explain and describe radiographic sensitivity;

(D) explain and describe radiographic contrast;

(E) present a film sample showing interpret shape recognition;

(F) explain the disadvantages of film graininess and mottle effects;

(G) process a film sample, explain how to interpret dark and light regions; and

(H) analyze the components of an interpret light source.

(7) The student applies an understanding of and identifies proper film handling, loading and processing. The student is expected to:

(A) identify and apply safe light and darkroom practices;

(B) describe and demonstrate loading bench and cleanliness;

(C) apply principles of proper opening of film boxes and packets;

(D) apply principles of proper loading film and sealing cassettes;

(E) explain and apply the techniques of proper handling of green film; and

(F) process a sample using the elements of manual film processing.

(8) The student applies an understanding of radiographic films production and reading. The student is expected to:

(A) process and produce an image using viewing single wall radiography technique;

(B) process and produce an image using viewing double wall radiography technique;

(C) process and produce an image using the viewing two walls simultaneously technique;

(D) process and produce an image that applies viewing elliptical techniques;

(E) process and produce an image using techniques of panoramic radiography;

(F) explain how to apply Fluoroscopic techniques to radiographic images;

(G) explain, apply and list the principles of direct screen viewing; and

(H) analyze the techniques of indirect and screen viewing.

(9) The student applies an understanding of and identifies interpretation of casting and wrought discontinuities. The student is expected to:

(A) perform checks and measure indications in a film sample;

(B) perform checks and measure discontinuities in a film sample;

(C) perform checks and measure a defect in a film sample;

(D) measure, identify, and label a casting process discontinuity in a sample;

(E) measure, identify, and label a casting process discontinuity in an ingot, bloom and billet sample;

(F) measure, identify, and label a sand-casting process discontinuity in a sample;

(G) measure, identify, and label a centrifugal casting process discontinuity in a sample;

(H) measure, identify, and label an investment casting process discontinuity in a sample;

(I) calculate, measure, identify, and label a wrought process discontinuity in a sample;

(J) measure, identify, and label a forging casting process discontinuity in a sample;

(K) measure, identify, and label a rolled product casting process discontinuity in a sample;

(L) measure, identify, and label an extruded casting process discontinuity in a sample;

(M) perform checks, identify, and label a casting process discontinuity in a sample;

(N) measure and label a welded casting process and associated discontinuity in a sample;

(O) measure, identify, and label a submerged welding casting process discontinuity in a sample;

(P) measure, identify, and label a shielded metal arc welding casting process discontinuity in a sample;

(Q) locate, measure, and label a gas metal arc welding casting process discontinuity in a sample;

(R) measure and label a flux cored arc welding casting process discontinuity in a sample; and

(S) measure and label a gas tungsten arc welding casting process discontinuity in a sample.

(10) The student applies an understanding of digital and computed radiography techniques. The student is expected to:

(A) identify and explain the process of interpreting digital image properties;

(B) identify and explain the operation of processing digital image components;

(C) research and identify image processing topics;

(D) explain and document the process of identifying incomplete fusion;

(E) explain and identify acquisition system considerations;

(F) analyze the processes of measuring image fidelity;

(G) define and plot image fidelity indicators;

(H) explain and identify computed radiography technical requirements;

(I) process and publish images using digital reference images; and

(J) explain and list the steps in a review of digital radiography industry standards.

(11) The student applies an understanding of the characteristics and applications of computed tomography imaging. The student is expected to:

(A) apply knowledge of, list, and identify general principles of computed tomography systems;

(B) describe, identify, and list the process of image interpretation and processing;

(C) use mathematical formulas to calculate advanced image processing algorithms; and

(D) explain, identify, and publish radiography safety principles.

Recommended Resources and Materials:

Radiographic Testing RT Classroom Training Book, ISBN 978-1-57117-376-8, American Society for Nondestructive Testing, Catalog No. 1644.

Nondestructive Testing: Testing Handbook, Set (10 Volumes) 3rd & 4th Editions.

Affordable Computer Based Education for NDT: Film Interpretation of Weldment Defects, USB Flash Drive.

Radiographic Film Interpretation of Weldments Training Program: Student Program Study Kit- Radiography Level I (RT), CD-ROM.

NDT Demonstration Kit

Chuck Heller's NDT Classroom, Online NDT Training.

Recommended Course Activities:

- History of Radioactive Materials (Why Safety?)
- Fundamental Properties of Matter
- Plotting of Radioactive decay
- Demonstrate proper usage of Sealed source device
- Demonstrate the steps in image amplification in a fluoroscopic device

Suggested methods for evaluating student outcomes:

- Written, oral and application assessments of safe film weldment elements and practices
- Ongoing radiographic safety and identification assessments
- Weekly film identification and usage assignments
- Oral and visual presentation of the casting process, identify ingots, blooms and billets.
- Cumulative assessment at the conclusion of the unit by way of oral and visual presentation of the wrought process, identify forgings, rolled products and investment casting, present to class examples of where they are used, must be at least 4 different industries
- Written and oral assessments of film weldment elements and practices. Students are expected to master content and application of skills at 85%.
- Nine week and semester final examinations that apply both written and practical applications of completed studies will be administered.

Teacher qualifications:

An assignment for Introduction to Film Interpretation of Weldments is allowed with one of the following certificates.

- Technology Education, Grades 6-12.
- Trade and Industrial Education (T&I), Grades 6-12.

Additional information:

The following are additional are quired trainings:

- Membership in Section ASNT – $350.00
- Film Weldments Course – $750.00