

CNST-2140: ADVANCED MATERIAL TESTING & INSPECTION

Cuyahoga Community College

Viewing: CNST-2140 : Advanced Material Testing & Inspection

Board of Trustees:

September 2023

Academic Term:

Fall 2024

Subject Code

CNST - Construction Engineering Tech

Course Number:

2140

Title:

Advanced Material Testing & Inspection

Catalog Description:

Introduces students to advanced material testing procedures and field inspection. Concrete and asphalt pavement construction methods, inspection, and testing processes. Inspection of surfaces and tolerances. Calculation of quantities. Utility and incidental construction inspection. Work zone configurations. Project responsibilities and documentation. Field trips may be required.

Credit Hour(s):

2

Lecture Hour(s):

1

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

CNST-1670 Highway Inspection, and CNST-2131 Construction Methods and Materials; or department approval.

Outcomes

Course Outcome(s):

Explain typical construction project hierarchies.

Essential Learning Outcome Mapping:

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

Objective(s):

1. Identify project roles, hierarchies, and responsibilities, including the authority of the inspector.
2. Identify and inspect required work-related postings.

Course Outcome(s):

Utilize print reading, mathematical, and surveying skills to accurately interpret what is represented by the project plans and specifications.

Essential Learning Outcome Mapping:

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

Objective(s):

1. Interpret highway drawings to identify types of views including planned profiles and sections.
2. Interpret specifications on civil highway drawings to identify appropriate materials in accordance with the design intent of the engineer.
3. Convert units from U.S. customary to metric system and vice versa as needed for job site interpretation.
4. Calculate areas and volumes of materials for job site.

Course Outcome(s):

Recognize work zone traffic control activities.

Essential Learning Outcome Mapping:

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

Objective(s):

1. Inspect placement of work zone traffic controls, including lane shifts, closures, detours, and construction access points and routes.
2. Compare proposed work zone traffic control methods to Uniform Traffic Control Manual.

Course Outcome(s):

Recognize required procedures for inspection of utilities and incidental construction.

Essential Learning Outcome Mapping:

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

Objective(s):

1. Inspect basic foundations for lighting, traffic signals, ground-mounted signs, and sound walls.
2. Inspect underground electrical conduit.
3. Inspect sidewalks, curbs and gutters, curb ramps, medians/median barriers, and driveways.

Course Outcome(s):

Recognize required procedures for inspection of concrete and asphalt pavement.

Essential Learning Outcome Mapping:

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

Objective(s):

1. Inspect existing surface preparation as required.
2. Inspect the application of tack coats.
3. Complete preplacement inspection, including grade control, equipment pre-checks, and paving plan review.
4. Visually identify asphalt mixes and properties.
5. Identify the requirements for materials sampling and verify conformance.
6. Inspect delivery, placement, compaction, and finishing of asphalt.
7. Calculate and interpret yield.
8. Inspect finishing and surface tolerances.
9. Inspect pavement curing, and saw cutting and sealing of joints.

Methods of Evaluation:

1. Laboratory assignments
2. Written assignments

3. Quizzes
4. Class participation
5. Final Examination

Course Content Outline:

1. Personal and Worksite Safety
 - a. Personal protective equipment (PPE) for material sampling and testing
 - b. Worksite hazards for materials sampling and testing
2. Plans and Specifications
 - a. Checking job specifications to determine sampling needs
 - b. Identification of locations on site for sampling
3. Sampling of asphalt mixes and components
 - a. Documenting sampling locations
 - b. Sampling procedures to obtain samples
 - c. Labelling sample origin and material
4. Asphalt Mix Sample Preparation
 - a. Reducing/splitting samples to test size
 - b. Conditioning the samples for testing by temperature
 - c. Labelling the prepared samples
5. Field and Laboratory Testing of Asphalt Mixes and Components
 - a. Field density tests of compacted asphalt mixes
 - b. Aggregate gradation tests
 - c. Asphalt content tests of asphalt mixes
 - d. Determination of the moisture content of asphalt mixes.
 - e. Determination of the moisture content of aggregates.
 - f. Maximum theoretical specific gravity and density tests of asphalt mixes
 - g. Bulk-specific gravity tests of compacted asphalt mixes
 - h. Fractured face tests of aggregates
6. Communication of Results
 - a. Collecting required test data for reports
 - b. Documenting field observations
 - c. Completing test forms and related reports
 - d. Reporting results to supervisor
 - e. Assessing reasonableness of results
7. Equipment Calibration and Maintenance
 - a. Verify lab testing equipment is calibrated for Level I tests
 - b. Verify field testing equipment is calibrated for Level I tests
 - c. Verify equipment operation for Level I tests
8. Utilities and Incidental Construction
 - a. Utility facilities affected by construction
 - b. Signage, Striping, and message marking
 - c. Guardrails, safety systems, and fencing
 - d. Basic foundations for lighting, traffic signals, ground-mounted signs, and sound walls
 - e. Underground electrical conduit
 - f. Sidewalks, curbs and gutters, curb ramps, medians/median barriers, and driveways
 - g. Landscaping and environmental mitigation
9. Site Operations
 - a. Components of work zone traffic control
 - b. Identification of construction activities
 - c. Erosion and sediment control components
 - d. Types of utility markings

Resources

Nicholls, Cliff. (2019) *Asphalt Mixture Specification & Testing*, CRC Press.

Resources Other

1. Ohio Department of Transportation (2023) Online Spec Book <https://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/Pages/2023-Online-Spec-Book.aspx>
2. Ohio Department of Transportation (2023) Online Location & Design Manual <https://www.transportation.ohio.gov/working/engineering/cadd-mapping/location-design-vol-3> (<https://www.transportation.ohio.gov/working/engineering/cadd-mapping/location-design-vol-3/>)

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