ATOE-1100: OPERATING ENGINEERING CONCEPTS

Cuyahoga Community College

Viewing: ATOE-1100 : Operating Engineering Concepts

Board of Trustees:
September 2025

Academic Term:
Fall 2025

Subject Code
ATOE - Appd Ind Tech-Operating Engin.

Course Number:
1100

Title:
Operating Engineering Concepts

Catalog Description:
Basic concepts of compaction, compaction equipment, design of paving operations, and design concepts of asphalt and skid steer loaders. Tractor-scraper and oiler
responsibilities also included.

Credit Hour(s):
4

Lecture Hour(s):
4

Lab Hour(s):
0

Requisites

Prerequisite and Corequisite
Departmental approval: Admissions to Operating Engineering Technology apprenticeship program.

Outcomes

Course Outcome(s):
N/A

Objective(s):
1. Discuss concepts relating to soil compaction.
2. Demonstrate methods of compaction with use of appropriate equipment.
3. Identify soil reactions.
4. Explain operating controls and safety features of skid steer loaders.
5. Demonstrate proper operational procedures for pavers.
6. Identify design concept of skid steer loaders.
7. Demonstrate maintenance of hydrostatic transmission.
8. Discuss design concepts of asphalt and tractor-scraper oiler responsibilities.
9. Explain operating controls and safety features of skid steer loaders.

Methods of Evaluation:
1. Quizzes
2. Exams
3. Classroom participation

Course Content Outline:

1. Methods of compaction
    a. Soil classification
        i. gravel
        ii. sand
        iii. silt
        iv. clay
        v. organic matter/colloids
            1. cohesive materials
            2. non-cohesive materials
    b. Soil mixing and soil moisture
        i. gravitation and capillary water
        ii. hygroscopic water
    c. Atterberg limits
        i. plastic limit (PL)
        ii. liquid limit (LL)
        iii. plasticity index (PI)
        iv. shrinkage limit (SL)
    d. Soil properties
    e. Soil testing
        i. optimum moisture
        ii. in-place density
        iii. nuclear soil density testing
2. Compaction equipment
    a. Four principles
        i. static weight
        ii. kneading action
        iii. impact
        iv. vibration
    b. Impact compactors
    c. Vibratory compactors
        i. fundamentals of vibratory compaction
        ii. frequency and amplitude
        iii. soil reactions and groundforce
3. Productivity
    a. Equipment selection
    b. Operating cost
4. Material design of paving operations
    a. Basic functions
    b. Basic operations
    c. Self-leveling and traction features
    d. Screed operations
        i. factors affecting the screed
        ii. paving speed
        iii. screed reaction time
    e. Adjusting mat thickness {manual paving}
        i. average depth method
        ii. desired yield method
        iii. gradation of material design
    f. Post-operation procedures
5. Design concepts of asphalt
    a. Temperature effects on rolling
    b. Paving depth in relation to rolling
        i. material design
        ii. grade conditions
    c. Roller patterns
    d. Cold weather operations
    e. Compaction equipment
    f. Roller patterns

   g. Determination of the rolling pattern
      i. choice of compaction equipment
      ii. rolling patterns
   h. Roller operating techniques
   i. Stopping work
   j. Hydraulic systems
6. Design concepts of skid steer loaders
   a. Optimum tread width to wheelbase ratio
      i. tread width
      ii. wheelbase
   b. Weight distribution and rates operating capacity
   c. Hydrostatic transmission
   d. Operating controls and safety features
   e. Basic operations
   f. Planning
   g. Periodic maintenance
7. Tractor-scraper
   a. Basic components
      i. gooseneck
      ii. bowl
      iii. apron
   b. Tractor
   c. Two-engine scraper
   d. Basic systems checks
      i. bowl
      ii. apron
      iii. ejector operations
   e. Operating techniques
      i. loading
      ii. dumping
      iii. push loading
      iv. maintaining haul road
      v. abnormal conditions/correct response
   f. Elevating scraper
      i. pre-shift inspection
      ii. basic systems checks
      iii. operating techniques
   g. Dual engine scraper
      i. single-engine
      ii. twin-engine
      iii. self-loading
      iv. cat and pan
8. Oiler responsibilities
   a. crane components
   b. ANSI b30.5 hand signals
   c. operations
   d. lubrication and maintenance

Resources

International Union of Operating Engineers, Local #18--Apprenticeship and Training. "Training for Operating Engineers, First Year"

International Union of Operating Engineers, Local #18--Apprenticeship and Training. "Training for Operating Engineers, Second Year, Book Two"

International Union of Operating Engineers, Local #18--Apprenticeship and Training. "Engine and Power Trains Training for Operating Engineers, Second Year Student Workbook"

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