

I. CATALOG DESCRIPTION:

A. Department Information:

Division: Technical
Department: Transportation
Course ID: RAIL 052
Course Title: Railroad Operations
Units: 3
Lecture: 3 Hours
Prerequisite: None

B. Catalog Description:

This course examines the railroad industries assets, organizational structure, and typical operations. Emphasis is placed on the current characteristics of North American railroads, basic operating processes in the transportation, mechanical and engineering functional areas, and administrative processes in the non-operating areas.

C. Schedule Description:

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II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

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

- A. Analyze the railroad industry's role in the North American economy.
- B. Outline the current route system and name the major railroad companies.
- C. List major categories of freight shipped by North American railroads.
- D. Define in general terms, the transportation components of the railroad industry: track and structures, the locomotive, the railroad car, and the train.
- E. Evaluate the overall process of signals and rail communication.
- F. Identify the different car types.
- G. Describe terminal operations in general terms.
- H. Categorize principles classification and blocking procedures.
- I. Differentiate in general terms line-haul and short-haul operations.
- J. Define inter-modal traffic and its primary components.
- K. Name the primary functions of the governing bodies of the railroad industry.
- L. Compare the typical administrative structure of a large and small railroad company.
- M. Assess how, within a larger railroad company, different departments interact.
- N. Define external customers and chart simple shipments from origin to destination.
- O. Define internal customers and describe typical communication procedures.
- P. Examine the difference between revenue and expense, and identify sources.
- Q. Analyze the current business challenges of the railroad industry, including competition, rising costs, and government regulations.

IV. CONTENT: Functions within Rail Operations

A. Rail Systems

1. Conditions leading to the present rail network
2. Classification of the different rail systems
3. Impact of varying levels of rail traffic on maintenance, operations, communication, and finances

4. Combining, coordinating, and connecting tracks and facilities for cost effectiveness
- B. Governing Organizations
 1. Roles of the American Association of Railroads; the Department of Transportation; the Surface Transportation Board; the Federal Railroad Administration; the National Transportation Safety Board; and the Occupational Safety and Health Administration
 2. Railroad industry's political challenges of doing business with Mexican and Canadian railroads
- C. Organization and Administration
 1. Activities in the engineering, mechanical and transportation areas
 2. Responsibilities of the marketing/sales, finance/accounting, law/public affairs, and administrative groups
 3. Interaction among various departments
 4. Key aspects of the Railway Labor Act, the collective bargaining process, and labor organizations
- D. Customers
 1. Determining customer needs and expectations
 2. Satisfying internal and external customers
 3. Comparison of the terms proactive and reactive
 4. Recent industry trends for improving customer service
 5. Importance of inter-departmental communication with internal customers
 6. Determining freight car types for external customers
 7. Typical commodities shipped, the preferred car types, and the features of the various freight cars
 8. Roles of the Electronic Data Interchange (EDI) and Automatic Equipment Inventory (AEI) to serve customers' needs for information
- E. Rail Traffic
 1. Description of inter-modal traffic, equipment, operations, and related issues
 2. Challenges of the inter-modal business
 3. Growth of inter-modal traffic
 4. Comparison of inter-modal, bulk shipments, passenger and manifest trains
 5. Factors determining traffic priority
- F. Physical Plant
 1. Basic track geometry
 2. Track components and specifications
 3. Processes involved in track construction
 4. Track structures and switch components
 5. Track deterioration problems
 6. Rail maintenance programs and repair procedures
 7. Preventative maintenance programs and repair procedures
 8. Preventative maintenance programs and inspections
 9. Wayside signals and detection units
- G. Equipment
 1. Standardization of freight car parts
 2. Identification of various freight car components
 3. Impact of increased loads on car and track construction
 4. Increase of system capacity by interchanging freight cars with other railroads
 5. Equipment leasing
 6. Freight car inspection and maintenance
 7. Locomotive types, parts, and components
 8. Use of helper engines, slugs and mates
 9. Electrical power conversion in locomotives
 10. Principles of traction and horsepower and how these relate to locomotive operation

11. Various train-track interactions and their impact on equipment design and maintenance

H. Centralized Functions

1. Conditions in the railroad industry during the 1970's
2. Changes in the railroad industry since the 1970's including market conditions
3. Market position of the railroads and how it led to deregulation in 1980
4. Freedoms of deregulation and how they contribute to competitiveness
5. Corporate restructuring, centralization, and the use of technology to increase productivity, profitability, and customer service capabilities
6. Recent efforts to continue railroad revitalization

I. Train Control

1. Train control and signaling systems
2. Manual, automatic, absolute-permissive, and cab signals
3. Interlockings functions (intersection of two railroads)
4. Technologies used to control and dispatch trains
5. Function of centralized traffic control centers
6. Relationship between the communication system and safe train operation
7. Advanced Train Control System (ATCS) Its function, technology, implementation, and advantage over traditional train control

J. Moving the Freight

1. Introduction and discussion of car movement cycle model
2. The processes involved in sales, negotiation, car location, car spotting, car releasing and car pulling
3. Car and train routing
4. Billing procedures
5. Processes involved in switching
6. Flat and gravity switching
7. Description of terminal and line-haul operations
8. Train arrivals and departures
9. Factors influencing assignment of locomotive power
10. Car movement, placement, and final release

K. Financial Performance

1. Key accounting figures in a balance sheet
2. Operating revenues, expenses, and operating ratio
3. Sources of railroad income and expenses
4. Surface Transportation Board's concept of Revenue Adequacy
5. Return Of Investment figures
6. How accounting practices affect railroad profitability
7. Railroad accounting figures and an evaluation of the relative financial health of a railroad

L. Challenges and Opportunities

1. Importance of changes in railroad operations
2. Various problem-solving steps and techniques
3. Current industry approaches to operating problems
4. Viewpoints on the future of the railroad industry
5. Efforts needed to ensure railroad stability and profitability

V. METHODS OF INSTRUCTION:

- A. Lecture
- B. Discussion
- C. Video
- D. Demonstration

VI. TYPICAL ASSIGNMENTS:

- A. A written report will be turned in to the instructor during the 15th class session. Cover and bibliography pages are additional and required. At least three different references will be

cited in the report properly and appropriately documented. An example of a written report is: "Write a report analyzing the impacts of traffic density on today's railroads."

- B. An oral report will be presented to the class covering the same topic. This oral report will be extemporaneous and utilize between 10 and 15 minutes of class time. Oral reports will be delivered during the 12th, 13th or 14th sessions of the semester.
- C. Assigned readings from the textbook.
- D. Use of video learning journals to process and record information learned from in-class videos. A learning journal will be prepared by each student for a certain number of videos of their choice. This learning journal will be legibly hand written and have three sections: 1.) The key points. 2) Writer's personal reactions (attitude) to the key points. (These should include personal opinion, judgments, thoughts and feelings.) 3.) A description of what the writer learned. (That is, brand new information received.)

VII. EVALUATION(S):

- A. Methods of Evaluation:
 - 1. Tests or Quizzes
 - 2. Assignments (Provided in Handouts)
 - 3. Final Comprehensive Examination
 - 4. Individual Semester Report
 - 5. Video Learning Journal
- B. Frequency of Evaluation:
 - 1. Tests or Quizzes bi-weekly
 - 2. Daily Assignments (Provided in Handouts)
 - 3. Final Comprehensive Examination mid-term and final
 - 4. Individual Semester Report
 - 5. Video Learning Journal weekly
- C. Typical Questions:
 - 1. List three of the four variables that determine the type of car needed for a particular commodity.
 - 2. Compare and contrast hump yards and flat yards. Define each, and point out the relative advantages and disadvantages of each.
 - 3. Briefly define the phrase "seamless service" as used in a railroad context. Describe what situations it applies to, the goal of seamless service, and some difficulties in implementation.

VIII. TYPICAL TEXT(S):

Armstrong, J. H., The Railroad – What It Is, What It Does., Fourth Edition, Omaha: Simmons-Boardman Publishing Co., 1998

IX. OTHER SUPPLIES REQUIRED OF STUDENTS: None