

# COURSE SYLLABUS

## CE 433-001

University of Kentucky  
Department of Civil Engineering  
Jerry G. Rose, OHR 261  
257-4278 [jerry.rose@uky.edu](mailto:jerry.rose@uky.edu)

Fall Semester 2014  
MWF 9:00 - 9:50 a.m.  
OHR C057  
[www.engr.uky.edu/~jrose](http://www.engr.uky.edu/~jrose)

### **Railway Freight & Passenger Operations and Intermodal Transportation**

#### **PRIMARY INSTRUCTOR**

Dr. Jerry G. Rose, Professor of Civil Engineering, serves as the primary instructor. Approximately one-half of the course will be devoted to Freight Railway Operations and Management. The other half of the course will be devoted to the emerging growth of the Intermodal Freight and Rail Passenger/Transit Systems and the other basic transportation modes. The instruction will be complemented with special speakers, out-of-class tours, and supplementary materials and presentations.

#### **TEACHING ASSISTANT**

A civil engineering graduate student, Jordan Haney, serves as the Teaching Assistant. His office is OHR C216, across the hall from my office. The office phone is 257-4349 and his e-mail address is [jordan.haney@uky.edu](mailto:jordan.haney@uky.edu). He will advise you of his office hours. He will conduct a limited number of classes in addition to reviewing out-of-class and other assignments.

#### **INTRODUCTION**

The course emphasises the transportation engineering aspects of railway operations – efficient movement of freight and passengers – and complements the existing “Railroad Facilities Design and Analysis” class (CE 533), which is offered in the spring semesters and places emphasis on the engineering aspects of railroad infrastructure. It provides students with instruction in the critical concepts and planning of railway operations. Students are exposed to the processes used for managing local railway operations to managing system-wide operations. The key planning roles of railroad professionals are stressed. Equal emphasis is placed on the increasing reliance on intermodal (multi-modal) freight transportation systems and the re-emergence of rail passenger, commuter, and transit systems, and their roles for the 21<sup>st</sup> century.

**NOTE: This course is being modified slightly to include more Multi-Modal Transportation. Somewhat less emphasis will be placed on Railway Transportation and additional emphasis will be placed on the other basic transportation modes – Water, Air, Motor-Freight, Pipeline, and Conveyor. The Intermodal section is being expanded to include these other transportation modes. This aspect of our total transportation system in the country is commanding more attention with emphasis on selecting the most economical/efficient use of our transportation resources.**

## EDUCATIONAL OBJECTIVES

The basic educational objective is to provide civil engineering students with a course emphasizing the transportation aspects of railway freight operations with additional emphasis on our nation's intermodal freight and rail passenger/transit transportation systems. It will benefit students wishing to pursue engineering employment in the railroad or rail transit industries with a railway company or governmental agency or a company providing services to the industry, such as a construction contractor, consulting engineering firm, or material/service supplier.

## OUTLINE

- the basic rail route structure,
- maintenance and management of the rail infrastructure and how they affect operations,
- the key roles of the operations management personnel,
- the daily activities involved in line of road, terminal, local, and network operations,
- evaluation and measurement of service design and operations,
- extrapolate the roles of the heavy freight railroad industry and the passenger, commuter, and transit rail systems for the 21<sup>st</sup> century,
- intermodal freight transportation, and
- passenger rail/mass transit systems.

## REQUIREMENTS

The textbook is *The Railroad – What It Is, What It Does*, 5<sup>th</sup> edition by John H. Armstrong.

A compilation of Outline/Reference Notes, PowerPoint Presentations, and Magazine Reference Materials are available.

Various handouts and study materials will be provided, including selected articles from *Railway Age* and *Progressive Railroading* magazines.

Class attendance is extremely important. Grades will be lowered for excessive absenteeism.

Out-of-Class assignments normally will be provided weekly by e-mail. A limited number of In-Class assignments will be given. Students are required to check their e-mail daily.

One or two field trips are planned to observe railroad and multi-modal operations. One or two guest speakers will present lectures.

This course prerequisite is CE 331 and engineering standing. It is expected that students have a basic understanding of transportation engineering and will be able to produce high-quality work.

## ENGINEERING ETHICS

It will be assumed that each student subscribes to a professional code of ethics that is the basis for behavior in class. Any and every case where these ethics are violated will be dealt with according to the provisions in the Student Code. **All cellular phones or electronic communication devices must be turned off during examinations. No text messaging permitted.** (Also, see the Undergraduate Study in Civil Engineering Handbook on Student and Faculty Responsibilities.)

## **GRADING**

Final Class Averages and Grades will be determined from class performance as follows:

30% - Exam I	90 – 100% = A
30% - Exam II	80 – 89% = B
30% - Exam III	70 – 79% = C
10% - In-Class & Out-of-Class Assignments	60 – 69% = D
	< 60% = E

## **COURSE DESCRIPTION**

A Study of the transportation engineering aspects of efficient management of railway operations including freight, passenger, and intermodal and multi-modal transportation.

## **EDUCATIONAL OUTCOMES**

<b>Week</b>	<b>Topic</b>
1	To provide the students with a basic understanding of how the heavy freight railroad and passenger, commuter, and transit rail systems have evolved and their effect on American industry and citizenry; including an analysis of the major objectives of a railroad's operating departments.
2	To provide details on how the rail routes and infrastructure are maintained and the effects of the infrastructure quality on operations; how the maintenance activities are planned and organized and how the quality level is measured.
3 & 4	To enable the students to understand the management, assignment, operation, and maintenance of the motive power and rolling stock; various accounting procedures for measuring efficiency; fleet cycle times; management and efficiency studies of the role of the locomotive engineer and trainmen in inspecting trains and practicing safe job procedures; and management and efficiency studies of the role of the locomotive engineer relative to safe train operating/handling practices, signal indications, safe job and train operation procedures.
5	To enable the students to understand the basics of train operations; laws and rules; generation of timetables, bulletins, and train documents; accident cause/finding; train control and signal systems; roles of the trainmaster.
6 & 7	To enable the students to understand the three types of train operations – <u>line of road operations</u> ; management studies of the role of the train dispatcher; innovative tracking techniques; root cause of analysis of operational efficiency; management of <u>terminal operations</u> ; role of the yardmaster; classification and blocking; and management of <u>local operations</u> ; industry service; roles of the industrial development and customer service representatives.
8	To enable the students to analyze network operations; managing locomotives, rolling stock, and crews; routing mixed freight, unit trains and intermodal trains; service design; planning process; measuring productivity; administration; law; accounting; and efficiency measurements.

- 9 - 11 To enable the students to understand and evaluate multi-modal and intermodal transportation planning process and interfaces involved with the various other modes – oceanic and inland waterways, highway motor transport, air transport, pipeline, and overland conveyor.
- 12 - 14 To provide the students with a basic understanding of the various rail passenger systems – including heavy rail transit, light rail systems, rail commuter service, intercity passenger service, and high speed-rail; role of rail passenger service in this country and comparisons with other countries; demands of passengers and measurements of acceptance; directions of the rail freight and passenger systems for the 21<sup>st</sup> century; interdependences of multi-modal systems; and innovations for improving productivity.

### **LEARNING OUTCOMES**

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

- Identify the various facets of the railway freight and passenger systems in the U.S.
- Articulate the various operational management aspects of the rail transportation systems,
- Understand railway activities involved in the daily line-of-road operations, terminal operations, and local operations,
- Identify the processes and interfaces involved with the other transportation modes – international shipping, domestic water, and highway – as an intermodal seamless operation,
- Understand the various demands and measurements of acceptance for the various rail passenger systems – including heavy rail transit, light rail systems, rail commuter service, intercity passenger service, and high-speed rail,
- Compare railway operations on an international scale with those in the United States,
- Access the changing objectives and requirements necessary for the expansion of the railway industry, including intermodal exchanges, in the United States and worldwide during the 21<sup>st</sup> century, and
- Prepare technical reports relating to selected aspects of the course and orally present findings and analyses.

### **ASSESSMENT OUTCOMES**

This class specifically relates to the University of Kentucky Civil Engineering Program Outcomes as follows:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multi-disciplinary teams.

- An ability to identify, formulate, and solve engineering problems.
- An ability to communicate effectively.
- An acquisition of a broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- A recognition of the need for, and an ability to engage in, life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**CE 433-001 SYLLABUS – FALL SEMESTER 2014**

Date	Topic(s) – See Educational Outcomes Section
Aug 27	Introduction
29	
Sept 1	Labor Day Holiday
3	
5	
8	
10	
12	
15	
17	
19	
22	

24	
26	
29	Examination I
Oct 1	
3	
6	
8	
10	
13	
15	
17	
20	Midterm
22	
24	
27	
29	
31`	
Nov 3	Examination II

5	
7	
10	
12	
14	
17	
19	
21	
24	
26	Thanksgiving Holiday
28	Thanksgiving Holiday
Dec 1	
3	
5	
8	
10	
12	
17	Examination III @ 8:00 a.m. (Wednesday)

**CE 433 PROPOSED SCHEDULE OF TOPICS FALL 2014**

**RAILWAY FREIGHT, PASSENGER, AND INTERMODAL TRANSPORT OPERATIONS (approximately 2/3 of course)**

Introduction to Railway Transport Operations

CE 433 Introduction

REES 2014-A(1) Intro. To North American Rail Transportation

REES 2014-A(2) Safety and Efficiency

REES 2014-C Vision for Railway Engineering Education

Railway Freight Transport Operations

Chapters 1-2 Introduction

Chapter 3 Introduction to Fixed Infrastructure --Track, Bridges, etc.

Chapters 4-16 (exclude Chap. 15) Railway Operations

Chapters 18-24 Railway Business and Management

Railway Passenger Transport Operations

Chap 17 Rail Passenger Services in the U.S.

REES 2014-F Passenger Rail Service

Railway Train Energy Power and Traffic Control

REES 2014-C

Railway Intermodal Transport Operations

Chapter 15 Intermodal Traffic

REES 2014-D Railway Intermodal Transportation

**MULTI-MODAL FREIGHT TRANSPORT (approximately 1/3 of course)**

Waterways Transport Operations

Motor (Highway Truck) Transport Operations

Air Transport Operations

Pipeline Transport Operations

Overland Conveyor Transport Operations