

COURSE SYLLABUS

CE 533-001

University of Kentucky
Department of Civil Engineering
Jerry G. Rose, OHR 261
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Spring Semester 2015
MWF, 11:00 – 11:50 a.m.
OHR C057
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Railroad Facilities Design and Analysis

PRIMARY INSTRUCTOR

Dr. Jerry G. Rose, Professor of Civil Engineering, serves as the primary instructor. The instruction will be complemented with special speakers, out-of-class tours, and supplementary materials and presentations. E-mail is best method to contact me. Office phone is fine; I am in the office about 50% of time. I don't keep specified office hours, but students can stop by anytime I am in the office or make an appointment. I am normally in the office on Monday, Wednesday and Friday mornings after about 7:00 am.

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. 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

This course provides civil engineering graduate and undergraduate students a transportation technical elective course emphasizing the civil engineering aspects of Railroad Engineering. Topics range from general information about the railroad industry to specific topics covering the design, construction, maintenance, operations, and evaluation of rail infrastructure and networks.

The students are expected to develop small group skills through team homework assignments and class interaction. Additionally, term project assignments enhance life-long learning and written communication skills.

It also provides student with an opportunity to familiarize themselves with railroad engineering and to determine if they are interested in pursuing this area as a career. This can be with a railroad company, consulting engineer, contractor, materials supplier, or governmental agency. Our nation's changing transportation needs indicate increased emphasis will be placed on rail transportation during the coming years.

EDUCATIONAL OBJECTIVES

The basic educational objectives are 1) to provide the students an awareness of major issues and problems of current interest to the railway industry; 2) to enable the students to apply existing technology to the design, construction, and maintenance of railway physical facilities; 3) to enhance the students' abilities to solve engineering problems, develop designs, and communicate the significance of the problems and

designs; and 4) to provide a forum for the students to evaluate their desire to pursue further educational and employment opportunities in the railway engineering profession.

OUTLINE

- Introduction to the Railroad Industry
- Nature of Railroad Traffic, Revenues, and Costs
- Location and Design Principles
- Track and Foundation Design and Analysis
- Drainage and Stabilization
- Track Construction, Rehabilitation, and Maintenance
- Track Geometry
- Safety Standards
- Track-Train Dynamics
- Signals and Operations
- Motive Power and Resistance
- Tonnage Ratings

RERERENCES

W. W. Hay, *Railroad Engineering*, 2nd Edition. Wiley Interscience (1982). Copies available on reserve in Engineering Library. This text is substantially supplemented with updated material.

Department of Civil Engineering, CE 533 Supplemental Lecture Notes, PowerPoint Notes, & Articles, and Outline Lecture Notes.

American Railway Engineering and Maintenance of Way Association, *Manual of Standard Practice*. AREMA. Available on CD-ROM in Kentucky Transportation Center Library.

J. H. Armstrong, *The Railroad: What It Is, What It Does*, 5th Edition, Simmons-Boardman (2008). Available on CD-ROM in Kentucky Transportation Center Library and on reserve in Engineering Library.

AREMA, *Practical Guide to Railway Engineering* (latest edition). Copies available on reserve in Engineering Library.

Association of American Railroads, *Yearbook of Railroad Facts* (latest edition). Class handout.

Federal Railroad Administration, *Track Safety Standards* (latest edition). Class handout.

REQUIREMENTS

All assigned work must be submitted in a satisfactory manner. Class attendance is mandatory and grades may be lowered for excessive absenteeism. Anyone cheating on an assignment or examination will be subject to dismissal from class with a failing grade or a more severe penalty.

Three examinations will be given. The second and third examinations will only cover material since the previous examination. Dates for the exams will be pre-announced.

Individual projects will be performed by students using the class for graduate credit.. A written term report and an associated oral presentation will be required.

Homework exercises will be assigned from time to time.

Various announcements and assignments will be communicated via e-mail. Students are required to check their e-mail daily.

Additional performance measures will be required for students receiving graduate credit.

This course subscribes to the standard language of the U.K. Policy on Academic Accommodations due to Disability.

Field trips to a classification yard and to measure track geometry on a main line are planned. Two or three speakers (railroad engineers) will address current track construction, rehabilitation, and maintenance practices.

The students should have had CE 331, CE 382, CE 381, and concurrently be enrolled in CE 471G. Engineering standing is required. It is possible, upon request, to receive a waiver from these requirements.

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. **Turn off all cellular phones or electronic communication devices during the test or quiz, no text messaging during either.** (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

- Students receiving graduate credit will have a required paper/project.

COURSE DESCRIPTION

Study of the principles of railroad location, construction, rehabilitation, maintenance, and operations with emphasis on track structure design and analysis, bridges and bridge loading, drainage considerations, track geometry effects, and operating systems analysis.

EDUCATIONAL OUTCOMES

Week	Topic
1 & 2	To provide the students with general understanding of the railway industry (Primarily taken from "Railroad Quiz," "Yearbook of Railroad Facts," and Chapters 1 & 2 from Armstrong textbook.). This includes definitions, history, general information, the basic job output, rolling stock, track and structures, regulations, financial affairs, and passenger service.
3 & 4	To provide the students with a more in-depth introduction to the railway industry, the nature

of railroad traffic revenues and costs and location/design principles. Utilizes Chapters 1 - 3 of Hay textbook and numerous recent references.

5 - 12 To enable the students to obtain the latest technological advances in the design, analysis, construction, maintenance and rehabilitation of the railway infrastructure – concentrating on track and foundation design analysis, drainage and stabilization effects, track geometry implications, track construction, rehabilitation and maintenance activities, safety standards, track train dynamics and signals, and operational effects. Utilizes Chapters 15 – 30 of Hay textbook and numerous recent references.

13 & 14 To provide the students with a knowledge of location and train operations. This includes motor power and resistance calculations and tonnage ratings. Utilizes Chapters 4-14 of Hay textbook and numerous recent references.

LEARNING OUTCOMES

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

- Develop an awareness of major issues and problems of current interest to the railroad industry.
- Utilize existing technology to the design, construction, and maintenance of railway physical infrastructure.
- Solve engineering problems, develop designs, and communicate the significance of the problems and designs.
- Be abreast of the current international technology relative to Railway Engineering.
- Assess the changing objectives, requirements and technological developments of the Railway Engineering profession.
- Prepare technical reports relating to selected aspects of the course and orally present findings and analyses.
- Evaluate his/her desire to pursue further educational and employment opportunities in the railroad engineering profession.

ASSESSMENT OUTCOMES

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

- A knowledge of the current status of the railway industry.
- An understanding of the effects of pre- and post-deregulation of the railway industry.
- An understanding of the historical development of the industry.
- An appreciation for efficient railway operations.
- An ability to design the structural aspects of trackbeds.
- An ability to design trackbeds using latest technology.

- An understanding of the various geometric features.
- An understanding of typical track maintenance activities.
- Understand the safety implications of railway operations.
- Provide a small group project, including a report and presentation.
- Be exposed to several practicing railway engineers and officials.

CHRONOLOGICAL ORDER OF TOPICS

PART I

Introductions (1), (2), (3), (4), and (5)

Introduction to Railway Infrastructure – REES

Chapters 1, 2, and 3 Hay Textbook

PART II

Chapters 15 through 24 (except Chap. 20) of Hay Textbook

Part III

Chapters 25 through 30 of Hay Textbook

Railway Bridges and Tunnels

Railway Communications and Signals

CE 533-001 SYLLABUS SPRING SEMESTER 2015

Date	Topic(s) – See Educational Outcomes Section
Jan. 14	Introduction
16	
19	Holiday
21	
23	
26	
28	
30	
Feb. 2	
4	
6	
9	
11	
13	Examination I
16	

18	
20	
23	
25	
27	
March 2	
4	
6	
9	Mid-Term
11	
13	
16	Spring Break
18	Spring Break
20	Spring Break
23	
25	
27	Examination II

30	
April 1	
3	
6	
8	
10	
13	
15	
17	
20	
22	
24	
27	
29	
May 1	End of Classes
	Examination III during Finals Week TBA