West Virginia University
Department of Civil and Environmental
Engineering CE 435 Railway Engineering
Spring

Course Syllabus

I. General Information

Instructor: Dr. Dimitra Pyrialakou
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Text: 1. *The Railroad: What It Is, What It Does, 5th Edition,* J.H. Armstrong, Simmons- Boardman (2008).

2. Additional selected texts from various sources that will be provided by the instructor during the course.

Meeting: TBD
Office Hours: TBD
Prerequisite: CE 332

II. Course Description

The field of railway engineering involves a number of engineering disciplines, including civil, mechanical, computer, electrical, and industrial engineering, that work together to provide efficient movement of passengers and freight via rail. Engineers working in this field are responsible for planning, design, operation, maintenance, and evaluation of the related infrastructure.

This course provides an overview of the basic elements, concepts, and terminology of railway engineering as well as of the history and role of the railroad industry. The emphasis of the class is on the civil engineering, and more specifically, transportation-related aspects of railway passenger and freight planning, design, and operations. In addition, topics related to intermodal and multimodal freight and passenger transportation systems are discussed.

The instruction of this course is based on various elements, including reading and homework assignments, interactive class discussions and in-class assignments and quizzes, guest lectures, and field visits.

Specific goals for the course:

(a) Specific outcomes of instruction: Upon successful completion of the course.

Learning outcome	**Student outcome**
Students will be able to identify the various elements of passenger and freight railway systems	A, B

Learning outcome	Student outcome
Students will be able to recognize the various railway activities involved in daily railroad and terminal operations	A, B
Students will be able to describe the interfaces between rail and other transportation modes and relate those to each other in order to plan seamless multimodal and/or intermodal operations	A, B, E, K
Students will be able to analyze and assess the various demands and measurements of performance for the various rail systems	A, B, K
Students will be able to compare railway operations on an international scale with those in the U.S.	A, J
Students will be able to describe the changing goals of the railway industry and the requirements necessary for the operation and expansion of railway systems in the U.S. and worldwide during the 21st century	J
Students will increase their proficiency in oral and written communication	G

(b) Accreditation Board for Engineering and Technology (ABET) Program student outcomes applicable to this course:

(a) An ability to apply knowledge of mathematics, science, and engineering
(b) Design, conduct experiments/ analyze and interpret data
(e) An ability to identify, formulate and solve civil engineering problems
(g) Communicate effectively in oral, written, and electronic format
(j) Knowledge of contemporary issues
(k) Use techniques, skills, and modern engineering tools

III. Course Outline

The course involves 9 main subject areas:

1. Introduction to Railroads
   - Railroad history and evolution
   - Rail transportation in the U.S. today and tomorrow
   - Railroad organizations

2. Railroad Track: Alignment and Structure
   - Track components and terminology
   - Track classification
   - Track geometry and design

3. Train: Locomotives and Cars
   - Types of locomotives
   - Types of cars
   - Components of cars (bearings, wheels, suspension systems, and others)

4. Railroad and Terminal Operations
    - Classification and blocking
    - Movement of cars and trains
    - Yard operations and activities

5. Signals and Communications
    - Signaling systems
    - Traffic control systems
    - Advanced train control systems
    - Other communication features

6. Train Capacity, Performance, Scheduling, and Administration
    - Train performance, efficiency, and productivity
    - Capacity factors and metrics
    - Train movements and schedules
    - Administration, law, and accounting

7. Passenger Rail
    - Types of passenger rail
    - Evolution and future of commuter, regional, and intercity passenger rail in the U.S.

8. Intermodal and Mutltimodal Transportation
    - Interfaces between rail and other transportation modes
    - Planning process

9. High Speed Rail (HSR)
    - Introduction to HSR technologies
    - HSR in the world and in the U.S.

IV. Attendance and Class Participation

Students are expected to attend all classes, and unexcused absences will be reflected to the semester's grade. Quizzes and graded in-class assignments missed because of an unexcused absence will receive a score of zero. For excused absences (university-sponsored activities, illness, or death of a family member), advance notification is required via email or by phone.

Active participation in all class activities is required. You will be tasked with completing the readings and the associated homework before each class, and in-class activities will build on these readings. All class meetings will be interactive and will require continuous participation by the students.

V. Homework Assignments

The objective of the assignments is to assist in the learning of course material and not solely to test the students' comprehension. As such, discussion of assignments among students is encouraged; group submission will be allowed, unless otherwise indicated. Assignments are

generally due at the start of the class period on the day indicated, unless otherwise indicated by the instructor. Late submissions will be subject to a ten-percent of an assignment's full value penalty per day (e.g., a 50-point assignment loses 5 points per day). If the assignments are submitted after the solutions are posted online, no points can be earned.

VI. Reading Assignments

The objective of these assignments is to stimulate in-class discussion about real-world applications of the principles and practice of railway engineering. Students are expected to have reviewed the readings before the class discussion. Students also are encouraged to bring in news articles for discussion and make short presentations.

VII. Quizzes & In-class Assignments

Pop-up quizzes and graded in-class problems will be given at the discretion of the instructor throughout the semester. Quizzes will typically involve an open-ended question based on the day's readings, but the students will be expected to have a basic understanding of all the material taught up to the point of the quiz. The lowest grade will be dropped for the final grade. In-class assignments will be given at the discretion of the instructor. The in-class assignments will typically be solved in groups and will aim to assist in the learning of the course material through the in-class collaboration of students and discussion of the topic of the day's session.

VIII. Exams

Two midterm exams and a final exam will be given. In the event of a major emergency, a make-up exam can be taken within 24 hours of the set exam date. The exams will not be "cumulative", but each one will be based on the learning objectives of the lessons covered in the corresponding one-third of the course. However, students will be expected to retain basic concepts and terminology from earlier parts of the course. All exams will be open book format.

IX. Course Grading

In-class participation, in-class assignments, and quizzes	15%
Homework assignments	40%
Three exams	15% (each)

X. Other Course Policies

You need to complete all requirements listed above to pass the course. Incompletes will only be considered for students who have completed approximately three-fourths of the class work. If you are ill or have some emergency, please contact me as soon as possible.

Academic Standards: You are expected to comply with WVU's academic standards, which can be accessed at
http://catalog.wvu.edu/undergraduate/coursecreditstermsclassification/

Inclusivity Statement: The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (304-293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu.