

## CEE 7300 RAILWAY ENGINEERING

**Spring 2016**

**Professors:** Dr. Leslie McCarthy, P.E.  
Office: Tolentine Rm 144  
Phone: 610-519-7917  
Email: [Leslie.McCarthy@villanova.edu](mailto:Leslie.McCarthy@villanova.edu)

Mr. Christopher Wright, P.E.  
Office: Tolentine Rm 144  
Phone: 215-789-2126  
Email: [Christopher.wright@aecom.com](mailto:Christopher.wright@aecom.com)

**Lecture:** Wednesday 6:15 pm - 9:15 pm

**Location:** Center for Engr. Educ. & Res. (CEER) Room 205

**Recommended Textbook:** J. Armstrong, *The Railroad: What It Is, What It Does*, 5<sup>th</sup> edition, 2008

**Office Hours:** W 4:45 pm - 5:45 pm

**General Email Hours:** MTWRF, 9:00 AM to 9:00 PM and Sunday 6:00 PM – 9:00 PM

### Course Outcomes:

1. describe the core functions of railway engineering as related to the national and global economy.
2. analyze and interpret key statistics that shape railway design and operations.
3. apply calculations and standards to design a railroad alignment and capacity of a rail line.
4. synthesize an existing intermodal transportation facility served by rail.

**Grading Policy:** Numerical averages for specific letter grades\* are as follows:

<u>Numerical Average</u>	<u>Letter Grade</u>
92 – 100	A
89 – 91	A-
86 – 88	B+
82 – 86	B
80 – 82	B-
75 – 79	C+
71 – 74	C
0 – 70	F

<b>GRADED ASSIGNMENTS:</b>	2 Midterm Examinations	20% each
	1 Semi-Comprehensive Final Exam	30%
	Case study paper / Class Projects	20%
	Homework	10%

### Reading Assignments:

There is not one good comprehensive textbook that addresses modern railway engineering, which ties in both freight and passenger rail. As such, students in this course will be provided with a series of reading assignments from a variety of sources, as well as previously-recorded online lectures, intended to supplement the learning provided in class sessions.

### Case Study Paper:

The case study paper will be due on March 9, 2016. It is to be no longer than 8 pages, 12-pt font, 1.5 line paragraphs. It is strongly recommended that formal technical writing style be used as well as proper referencing of sources. The grading rubric to be used to grade the case study paper is provided with the assignment itself and is intended to guide students to a successful outcome.

### **Class Project:**

The class project will be due on April 27, 2016. This will be an opportunity for students to compile a conceptual railroad design using skills learned in class as well as related civil engineering design subjects such as drainage, utilities, and site design. The grading rubric to be used to grade the class project is provided with the assignment itself and is intended to guide students to a successful outcome.

### **Course Policy:**

1. Attendance in class (or online) is expected and necessary to successfully completing the course. If a conflict arises in which you cannot attend class, please notify the instructor in advance of the class meeting.
2. Homework assignments, the class project, and the case study paper are to be submitted at the beginning of class on their assigned due date.
3. The instructors will discuss any exam grade within 48 hours (excluding weekends and holidays) of their return, after which time the discussion is closed.

### **Midterm and Final Exams:**

You will have two midterm exams and one final exam for this course. The exams must be completed individually which means that you cannot, in any way, communicate or work with other students during the exam period dates. There will be no exceptions to the dates set for the exam nor the time period in which to complete the exams. The exam must demonstrate an independent effort and failure to do so will result in a zero for the exam and possibly for the course.

Prior consent of the Instructors or a doctor's certificate of illness is the only satisfactory excuse for making up an exam. In such cases a make-up exam will be provided.

### **Discussion Points:**

At the conclusion of most learning modules, the Instructor will initiate and facilitate discussion points. It is an active learning technique used to help recap information that was key to achieving higher learning outcomes. It also provides another mechanism for the Instructor to assess how fully each student is engaging in the course and creates a safe environment for sharing experiences and asking questions. Many of the students in this course are working professionals, and there is a wealth of information to be learned from one another. We want to take advantage of that unique and great opportunity for learning at the graduate level! In addition, the discussion points may be graded, at the discretion of the Instructor.

### **Tentative Course Schedule:**

The planned course schedule is provided on the following page.

**There are 4 recorded videos that you are expected to watch during this semester!** Please see page 4 of the Syllabus for the web link that you must use to access the recorded videos and the "Notes" column to see which past Lecture recording number you'll need to access.

Date	Lecture No.	Title	Topics	Reading / Recording Assigned	Notes
Jan 13	1	Introduction to Course	<ul style="list-style-type: none"> <li>• Introduction to Railway Engineering</li> <li>• Modern railroad history and North American Freight Railroads</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 1</li> <li>• Watch Mr. Larry DeYoung (recorded video Lecture 11b)</li> </ul>	Summer 2012 CEE 7300 Lecture 11b
Jan 20	2	Moving Freight	<ul style="list-style-type: none"> <li>• Train energy</li> <li>• Locomotive power</li> <li>• Kinematics</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 2, p. 7-13</li> <li>• Chapter 6, p. 113-119, 130-133</li> </ul>	
Jan 27	3 (recorded, no in-class session today)	Rail Infrastructure	<ul style="list-style-type: none"> <li>• Components &amp; material specifications</li> <li>• <u>Discussion points (to do on your own, submit next week – they will be graded as a homework)</u></li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 3, p. 29-46</li> <li>• Watch Dr. McCarthy (recorded video Lecture 2)</li> </ul>	Summer 2012 CEE 7300 Lecture 2 * Recorded lecture only No in-class session
Feb 3	4	Types of Freight Rail Facilities	<ul style="list-style-type: none"> <li>• Types of trains and Train performance</li> <li>• Intermodal freight &amp; shortline railroads</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 8, p. 173</li> <li>• Chapter 15</li> </ul>	Practice problems assigned
Feb 10	<b>MIDTERM EXAM I taken during class time &amp; submitted at 9:15 pm (no exceptions)</b>				
Feb 17	5	High Speed Rail and Passenger Rail Lines	<ul style="list-style-type: none"> <li>• High speed rail design</li> <li>• Passenger and intercity rail</li> <li>• Considerations for passenger modal shifts</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 17, p. 251-261</li> <li>• Watch Dr. T.C. Kao, Univ. of Illinois (recorded video Lecture 9a)</li> </ul>	Summer 2012 CEE 7300 Lecture 9a
Feb 24	6	Mass Transit Systems	<ul style="list-style-type: none"> <li>• Rail mass transit facilities and systems</li> <li>• Platform design</li> </ul>	<ul style="list-style-type: none"> <li>• Handouts</li> </ul>	
Mar 2	<b>Spring Break Week – NO CLASSES</b>				
Mar 9	7	Designing a Rail Line Part I	<ul style="list-style-type: none"> <li>• Railway alignment</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 3, p. 21-28</li> </ul>	CASE STUDY PAPER DUE
Mar 16	8	Designing a Rail Line Part II	<ul style="list-style-type: none"> <li>• Railway alignment exercises</li> <li>• Drainage systems</li> </ul>	<ul style="list-style-type: none"> <li>• Watch Mr. Michael Pluimer (recorded video Lecture 7a)</li> </ul>	Summer 2012 CEE 7300 Lecture 7a
Mar 23	9	Railway Operations	<ul style="list-style-type: none"> <li>• Railroad capacity</li> <li>• Shared corridor challenges</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 7, p. 135-143</li> <li>• Chapter 22, p. 300-305</li> </ul>	
Mar 30	<b>MIDTERM EXAM II taken during class time &amp; submitted at 9:15 pm (no exceptions)</b>				
Apr 6	10	Track and Yard Design	<ul style="list-style-type: none"> <li>• Intro to track and yard design</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 12</li> </ul>	
Apr 13	11	Railroad Safety	<ul style="list-style-type: none"> <li>• Train and track safety</li> <li>• Rail-Highway Design Issues</li> <li>• At-grade railroad crossings</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 2, p. 14-19</li> <li>• AASHTO Greenbook &amp; FHWA MUTCD</li> </ul>	
Apr 20	12	Rail Line Functionality	<ul style="list-style-type: none"> <li>• Advanced train operations (PTC)</li> <li>• Traffic control</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter 7, p. 143-151</li> </ul>	CLASS PROJECT DUE
Apr 27	13	Railroad Construction	<ul style="list-style-type: none"> <li>• Case studies: Various freight railroad capital improvement projects</li> </ul>		
May 4	<b>FINAL EXAM taken during class time &amp; submitted before 9:15 pm (no exceptions)</b>				

### **Recorded Lecture Videos:**

In order to access the 4 recorded lectures noted in the table on Page 3, you must click on this link: <http://elearning.engineering.villanova.edu/Mediasite/Catalog/Full/83eea82931634818bb70f230250db1a421>

This link is also provided to you on Blackboard for this course.

### **Class Exercises and Practice Problems:**

In some learning modules, the Instructor will assign problems to be completed in small groups or individually during class time which will be graded. Each online student will be assigned another online student to buddy with over the course of the semester and the AOL Chat or another online chat tool should be used to communicate with each other during class exercise periods. Solutions to the problems will be posted to Blackboard or emailed out to students. The intention of in-class exercises is to provide you with more problem-based learning and to give students a sense of the type of exam problems to expect.

### **Academic Honesty Policy:**

All students admitted to Villanova University are subject to the statement of academic honesty committing them to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a Villanova student and to be honest in all work submitted and exams taken in this course, including not changing answers and seeking extra points after a graded exam is handed back to you. In addition, this includes not sharing references or sources with each other during the exam periods, not using the Internet or other online sources in the completion of exams, and not discussing questions/answers of an exam with others. If the Instructor suspects that academic dishonesty has taken place, the burden of proof is placed on the student and not on the Instructor. Violation will result in a “0” for the assignment or exam and possible academic suspension by the Dean of the College of Engineering.

### **Instructor’s (My) Responsibilities:**

- Create and deliver course materials that will help to meet the Outcomes listed on the syllabus;
- Timely return of graded assignments and exams;
- Uphold the integrity of the classroom participation and student performance on assignments and exams; and,
- Encourage and make opportunities for active learning in the classroom.

### **Student’s (Your) Responsibilities:**

- Print and make sure to read *Course Syllabus*;
- Print *Lecture Notes*, *Homework*, and *Handouts* from Blackboard on time to be prepared;
- Complete reading for Each Module in textbook or by watching recordings in advance of the class period; and,
- Contact the Instructor by email in advance of class period if you are not going to make it to class.