



Course Syllabus
CE4405 – International Railroad Engineering
College of Engineering
Summer 2009

Instructor Information

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Course Identification

Course Number:
Course Name: Railroad Track Engineering and Design
Course Location: EERC B11 (May 4 -11)
Class Times: Daily 9:35am – 12:25pm (9:05-10:50 am in Finland)
Prerequisites: -----

Course Description/Overview

This 3 credit course provides an interdisciplinary and international overview of railroad industry. The emphasis is slightly on topics related to civil engineering discipline. The course will include several guest lectures, case studies and field visits, which secure that students leave the program with a broad and practical view of the modern railroad industry. The course will require students to use creative thinking and team work for solving open ended problems. By the end of the course, students will have a basic understanding in the fundamentals of the railroad infrastructure, passenger and freight operations and equipment, know the principle components and terminology used in different aspects of rail transportation, and understand the uniqueness of rail transportation, when compared with other transportation modes.

The course will cover a wide variety of topics within railroad field, including different rail transit modes, railroad history, railroad operations, motive power and train characteristics, safety issues, track design and analysis, signals and communications and construction and maintenance. The general list of topics is presented at the end of this syllabus.

Course Learning Objectives and Instructional Methods

Course objective is to gain the basic understanding of railroads as a transportation industry. It will approach the subject from multi-discipline perspective, where different fields within and outside engineering are merged together to a complete package. Students will be able to recognize fundamental differences between rail and other transportation modes. Due to the international nature of the course, students will experience two different rail systems (USA and Finland) and will be able to analyze the advantages and disadvantages of each. They will have an understanding of the considerations required, when designing rail facilities. The course will improve student's skills to analyze and utilize covered material appropriately and search for necessary information both by making questions and through individual and group research.

The course will incorporate several different instructional methods. Some of the methods used during the course include interactive lectures, guest lectures, class discussions and exercises, field visits and open ended case studies followed by team presentations. The interactive lectures will be used to overview the materials covered in reading assignments. The purpose is to clarify the potential misunderstandings of assignments and to provide a deeper understanding to the content through guided discussion. Guest lecturers by industry professionals and real life case studies are used to link the covered material to the real industry problems. Working with the open ended cases in teams encourages the use of creative thinking and provides an opportunity to create solutions, while final presentations and discussions are geared toward improvements in oral output. Field visits are used to provide the link between the topics studied and the actual practices. This will deepen the students' understanding of the topics by providing visual examples of the course contents.

Course Resources

Course Website(s)

- Blackboard<<http://www.courses.mtu.edu>>

Required Course Text

- No required text.
- Selected texts from various sources, handouts and other additional material will be provided by the instructor during the course and through Blackboard course site or public folder. Students are encouraged to look for additional information from the internet and library sources. Some of the publications used during the course include *Practical Guide for Railroad Engineering* by AREMA, *Railroad Operation and Control* by Joern Pachl, *All About Railroading* by William Vantuono, *Railroad, What it is, What it does*, 5th Edition, John D. Armstrong, Simmons-Boardman Books, Inc., 2008, and *Railway Engineering*, 2nd Edition by William Hay.

Grading Scheme

Grading System

Letter Grade	Percentage	Grade points/credit	Rating
A	93% & above	4.00	Excellent
AB	89% – 93%	3.50	Very good
B	85% – 89%	3.00	Good
BC	80% – 84%	2.50	Above average
C	75% – 80%	2.00	Average
CD	70% – 75%	1.50	Below average
D	64% - 70%	1.00	Inferior
F	63% and below	0.00	Failure
I	Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student's control. A grade of incomplete may be given only when approved in writing by the department chair or school dean.		
X	Conditional, with no grade points per credit; given only when the student is at fault in failing to complete a minor segment of a course, but in the judgment of the instructor does not need to repeat the course. It must be made up within the next semester in residence or the grade becomes a failure (F). A (X) grade is computed into the grade point average as a (F) grade.		

Grading Policy

Grades will be based on the following:

Grade division	Percent of total grade
Weekly tests	40%
Assignments and projects	40%
Attendance and Participation (includes potential morning quizzes)	20%
TOTAL	100%

Course assignments are mainly open book and are designed to enhance students' capabilities to use collaboration and team work toward one common goal. They will also enhance students' independent analyzing skills and help them apply data to the practical applications. Due to the short duration of the class, it is extremely important that all the deadlines are honored, unless agreement for extension has been negotiated in advance.

The grading of the class will incorporate following methods.

- There will be three graded tests during the course. They will all be open book format. The tests are not limited to the material covered during the week, but may require use of information from the earlier topics. The first two tests can be retaken orally the following week, as necessary (max. 50% of the lost points may be recovered). In case a pattern of poor preparations occur, quizzes may also be added to the beginning of each class to assess the knowledge of the daily reading assignment.
- Several group and individual assignments will be used during the course. Teams are organized across disciplines to enhance interdisciplinary activities. Assignments often include a team presentation followed by discussion or a debate. If significant portions of an assignment are missing or inaccurate, assignment must be resubmitted with corrections.
- Since the course is extremely intensive (lasts only 5 weeks), active participation in the class discussions and preparation to each day's class are absolutely essential to the success. **Students are also required to submit journals**, which will become a portion of the participation grade. All lectures are interactive and will utilize questions and discussions that require continuous participation by students. Each student will self-evaluate their participation and it will be compared to the instructor's evaluation. Any absence from the class must be discussed in advance and absence without permission will affect negatively to the participation portion of the grade.
- Attendance and participation grade is based on Instructor's evaluation and student self-evaluation, which is performed after the 1st week and at the end of the program. In the evaluation, students will evaluate, how many points they have earned in each 5 participation category (on-time appearance, participation activity, timeliness and quality of homework, efforts for group learning and journal). This will be compared to instructor's evaluation and final participation grade will be determined by instructor after reviewing the journals.
- In addition to the official instructor evaluation, students are encouraged to provide informally both oral and written feedback about instructor's performance. An informal feedback session will be held at the end of each week to review the course progress and to identify necessary improvements.

Late Assignments

Late submittals of assignments will cause automatic 50% reduction of available points, unless exceptional circumstances have prevailed, as determined by the instructor. Assignments will be submitted in electronic or paper format, based on instructor instructions.

Course Policies

Any absence from the class must be discussed in advance and absence without permission will affect negatively to the participation portion of the grade. The teams are expected to solve potential conflicts internally and are advised to approach the instructor for conflict resolution only when internal efforts haven't been effective.

Collaboration/Plagiarism Rules

Collaboration on individual and group assignments is recommended.

Cell phones, Blackberries, iPods, PDAs, or any other electronic devices are not to be used in the classroom. Please make sure to bring a calculator with you to class. Calculators on other devices are strictly prohibited. Information exchanges on these devices during class are also prohibited and violate the Academic Integrity Code of Michigan Tech.

University Policies

Academic regulations and procedures are governed by University policy. Academic dishonesty cases will be handled in accordance the University's policies.

If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following:

Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office, at 487-2212. For other concerns about discrimination, you may contact your advisor, department head or the Affirmative Action Office, at 487-3310

Academic

Integrity:http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html

Affirmative Action:

<http://www.admin.mtu.edu/aao/>

Disability

Services:http://www.admin.mtu.edu/urel/studenthandbook/student_services.html#disability

Equal Opportunity Statement:

<http://www.admin.mtu.edu/admin/boc/policy/ch3/ch3p7.htm>

Course Schedule

Tentative content and schedule (changes in content and schedule are expected depending on progress and field visit schedules)

Approx. 35 hrs of lectures + tours and field visits

Day ***Topic***

Location: Houghton, Michigan

- May 4 Introduction to railroads**
Railroad history
Rail transportation in the U.S. today and its significance
Railroad organizations
Types of passenger rail transportation (HSR, Intercity, Commuter, LRT, APM)
North American railroads tomorrow
Guest lecturer: *Dr. Bill Sproule*
- May 5-6 Train dynamics, Motive power and Railroad safety**
Train dynamics
Motive power, cars and key train components
Rail safety (safety course through internet)
- May 7-8 Operations and Signals**
Railroad operations
Yard and terminal operations
Intermodal operations
Signals and communications, Positive train control
Guest lecturer: *Eric Peterson (CSX retired)*
- May 11 Presentations & 1st Test**
Group project presentations: TBD
Departure to Chicago
National Railroad Museum visit in Green Bay, Wisconsin

Location: Chicago area, Illinois

- May 12-14 Field visits (Chicago area)**
Wisconsin Southern Railroad
CN dispatching center and locomotive shop
BRC classification yard
CSXI Intermodal yard
Metra Commuter Rail & CREATE project headquarters (tentative)
Western Railway Club (tentative)
Railroad engineering consulting company – Patrick Engineering
- Departure to Finland from O'Hare, May 14, 2009

Location: Tampere, Finland

- May 18 Operations and Chicago field visits wrap-up**
- May 19-20 Passenger rail**
High speed rail and other passenger rail modes

Passenger rail in North America vs. in the World
Discussion of future railroads

May 21 **Holiday – No class**

May 22 **Field visits (Hyvinkaa & Helsinki)**

Konecranes (tentative)

Riding high speed rail

Finnish Railroad Administration and railway facilities (tentative)

Helsinki trolleys & local trains

May 25-28 **Track components, construction and maintenance**

Guest lectures by Gray Chandler (CSX retired)

2nd Test – May 26

Track components, materials and cross section

Construction and maintenance methods and equipment

Selection between alternatives: (location, revenues, capital costs,
construction process)

May 29 - Jun 2 **Track design aspects**

Guest lectures by Gray Chandler (CSX retired)

Horizontal / vertical curves and superelevation

Railroad vs. highway design comparison

Basic track design

Highway – Railroad intersections (Grade crossings)

Alignment types (mainline, yard, industry tracks)

Classification yards and capacity

Field visit: Railroad construction site (TBD)

June 3 **3rd Test**

June 4 Wrap-up.....Enjoy the summer!!!