

# CEE 310 - TRANSPORTATION ENGINEERING

MWF 11-11:50 am, 1518 Hydro-Systems, Fall 2007

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Office Hours: 1-2 MF or by appointment

**Instruction:** Prof. Ouyang will teach Blocks 1 through 5,  
Introduction and Transportation Systems (first half of semester)

Prof. Tutumluer will teach Blocks 6 through 9,  
Transportation Facilities (second half of semester)

**Text and Notes:** Class notes will be used along with text during the semester.  
Notes can be purchased in B114 NCEL.

Garber, N. J., and L. A. Hoel. *Traffic and Highway Engineering*,  
3<sup>rd</sup> Edition. Brooks/Cole Publishing, 2001.

**Class Web Site:** <https://compass.cites.uiuc.edu/>

## **Course Content:**

This course provides an introduction to the planning, design and operations of transportation systems, and materials selection, design, operation, management, and maintenance of transportation infrastructure. Functional design concepts for both transportation systems and facilities with life cycle costing procedures and criteria for optimization are introduced. This class will help students (1) become familiar with transportation engineering and most planning and engineering design problems in this context; and (2) apply the methodologies introduced in this course to solve transportation engineering problems.

The course content will be covered in three main sections: Section I, Introduction: This section discusses the importance of transportation, its key economical impacts, and multi-modal transportation systems (highways, air,

rail, etc.). Section II, Systems: This section provides an overview of transportation planning and engineering issues, including demand analysis, human factors, roadways design, network performance, traffic flow dynamics, capacity analysis, and network equilibrium. Section III. Facilities: Structural characteristics, loading conditions, design, and performance of transportation facilities including pavements and railroad tracks are introduced. Types, properties, specifications, and construction of typical transportation materials are addressed.

## **Course Outline:**

### **Section I: Introduction**

#### **Block 1- INTRODUCTION (2 lectures)**

- Importance of transportation
- Key historical notes
- Transportation modes and their functions
- Critical issues

#### **Block 2- TRANSPORTATION INFRASTRUCTURE (1 lecture)**

- Economic role of transportation
- Modal usage and loadings
- Transportation related organizations

### **Section II: Transportation Systems**

#### **Block 3- HUMAN FACTORS AND DESIGN ELEMENTS (6 lectures)**

- Vehicle, driver characteristics
- Sight distances, stopping distances
- Geometric design, horizontal and vertical curves

#### **Block 4- NETWORK PERFORMANCE AND EQUILIBRIUM (6 lectures)**

- Traffic flow, capacity, and dynamic behavior
- Bottlenecks, intersections, and queuing theory
- Temporal and spatial network equilibriums (trip assignment)

#### **Block 5- PLANNING AND DEMAND ANALYSIS (6 lectures)**

- The transportation planning process
- Trip generation, distribution, mode choice

### **Section III: Transportation Facilities**

#### **Block 6- PERFORMANCE AND STRUCTURAL CHARACTERISTICS (6 lectures)**

- Statistics, equipment, structure, deterioration and condition assessment for each mode

- Load conditions for track and flexible and rigid pavements
- Stress, strain, and deflection responses for typical track and pavement structures

Block 7- SUBGRADE SOIL PROPERTIES (5 lectures)

- Subgrade characteristics and properties
- Analysis of soil properties
- Unified and AASHTO classification procedures
- Compaction issues including moisture-density relationships, effects of compaction on subgrade properties, and compaction methods

Block 8- AGGREGATE PROPERTIES (4 lectures)

- Definition and purpose of aggregates
- Sources of aggregates
- Properties, including strength and modulus, particle size, and moisture effects on ballast and granular subbases and base courses
- Quality of aggregates

Block 9- SURFACE MATERIALS (3 lectures)

- Portland cement
- Portland cement concrete (PCC) properties, testing and paving
- Asphalt cement
- Asphalt concrete properties, testing, paving, and surface treatments

**Classroom Activities**

**Participation:** Student participation inside and outside the classroom is essential for learning. Students must be present in the classroom (attendance will be taken), interact with the professor, and be actively involved in the classroom activities.

**Teaching Assistants:** Due to the increased number of students, there are teaching assistants (TAs) assigned to this course. Please fully utilize the TAs' assistance during their office hours for your course-related questions, homework problems, etc.

**Student Feedback:** Throughout the semester, students are encouraged to bring to the attention of the TAs or the professors any difficulties/problems encountered during the lectures. Feel free to comment on issues that are or are not going well. Let's join together in making CEE 310 as educational and enjoyable for you as possible!