

# CE 367G: Design & Evaluation of Ground-Based Transportation Systems

## Spring 2014 (unique #16040)

Lectures: Tu/Th 12:30 to 1:45 pm, in 5.410 ECJ  
Laboratory Section: Mondays 12:00 to 2:00 pm, in 3.402 ECJ

### I. Office Hours for Dr. Kara Kockelman

Mondays 2:00pm to 3:30 pm & Tuesdays 2:00 to 3:00 pm, 6.904 ECJ  
Or by appointment: 471-0210 (office phone number) & kcockelm@mail.utexas.edu

Note: Dan Fagnant (danfagnant@hotmail.com) will serve as the course TA and lab instructor.

### II. Prerequisites

According to the College of Engineering Catalog, CE321, Transportation Systems, is a prerequisite for undergraduates intending to enroll in CE367G; the consent of the instructor may waive this requirement.

### III. Grading

For purposes of grading, the performance of students enrolled in CE367G will be assessed using the following scoring system:

Design Assignments	20 to 25% of score/grade
Project Work	40%
First In-Class Exam	15%
2nd In-Class Exam	20 to 25%

Note: The instructor reserves the right to consider Class Participation & Quizzes in the evaluation of a student's performance, where participation score is based on participation in the class (including attendance, in cases where attendance is poor). These two items may contribute up to 8% of a student's grade, falling uniformly across categories. Lab participation will count toward the Design Project's grading. Pluses and minuses will be used. Exam dates are discussed below.

### IV. Design Assignments

Design-focused assignments will often tie to laboratory activities and are structured to help students develop the necessary skills to successfully complete final course projects. These assignments will be assigned regularly and must be handed in at the *beginning* of the period in which they are due. After this time, they will be considered late and given *no credit*. However, ***all assigned problems must be completed*** (within 3 weeks of their due date and at least one week before the final exam) or a student's participation score will be adversely impacted. Please note all questions for the grader on your homework before re-submitting it, for added review.

### V. Examinations\*

The two in-class exams are *tentatively* scheduled for the following times. (The final exam period, on, Thursday, May 8, 2:00-5:00 pm, will be reserved for student-team presentations of final design projects to the class and several practicing professionals. NOTE: final reports will be due by 10:00am on Wed, May 7 for sending to Judges.)

Exam 1	Tuesday, March 4 (tentative)
Exam 2	Thursday, April 24 (tentative)

\* The instructor reserves the right to periodically administer, grade, and use in student evaluation “pop”/unannounced quizzes. Students should come to class prepared to contribute to each class’s lecture and discussion by staying up-to-date with homeworks and reading.

Make-up exams will *not* generally be given to any student. If a student is absent from a scheduled exam due to medical or other problems beyond her/his control and can plainly demonstrate this, the instructor can choose to give the student a completely different exam, additional assignments, and/or change the weighting of the student’s various graded contributions.

## **VI. Laboratory Sections**

The laboratory sections are intended for additional depth in important technical areas, to hone abilities useful for analysis of multi-faceted projects, and application in the course’s final design project. There will be demonstrations and some hands-on learning of computer-aided design (CAD) software in one or two of these lab times (with Microstation and GEOPAK assignments available at [http://www.ce.utexas.edu/prof/kockelman/ce367\\_201101/GeometricDesignLab.htm](http://www.ce.utexas.edu/prof/kockelman/ce367_201101/GeometricDesignLab.htm)). And there is a Project Evaluation Toolkit (PET) for large-scale systems evaluation at [http://www.ce.utexas.edu/prof/kockelman/PET\\_Website/homepage.htm](http://www.ce.utexas.edu/prof/kockelman/PET_Website/homepage.htm). Other lab sections will involve application of ArcGIS for mapping Austin land use files to transportation project sites, cultivate more familiarity with MS Excel’s financial calculation tools, and emphasize proper use of the *Highway Safety Manual* and transportation system design methodologies found in other key texts. In the final 5 or so weeks of the semester, the lab slots will be exclusively reserved for teamwork on each team’s selected capstone project. Other reading of interest includes the *ITE Trip Generation Manual*, *TRB’s Highway Capacity Manual*, and *Manual on Uniform Traffic Control Devices*.

## **VII. Design Project, Course Objectives, Academic/Leaning Goals**

A number of courses in the Civil Engineering program curriculum have been designated as “design synthesis” courses. This is one of those courses, so your final project requires recognition of engineering standards of safety and quality, alongside various real-world constraints, including economic, environmental, social, political, ethical, and public health factors, demand for transportation system services, constructability and sustainability.

To this end, upon completion of this course, students should have the following skills:

- The ability to identify existing or emerging deficiencies within a transportation system.
- The ability to generate, evaluate and select a preferred project alternative through technical analysis.
- The ability to develop a comprehensive project design while implementing a preferred transportation project alternative.
- The ability to successfully operate in a project team setting.
- The ability to justify analysis results and design choices through written and oral means.

The design project for this course involves the specification and evaluation of a significant transportation investment (costing at least \$1 million, and potentially several hundred million dollars). Each four-person design team will decide the scope of their unique project in consultation with the course instructor and TA. These may be a transit-oriented development, the neighborhood(s) around a light- or heavy-rail line, a major highway interchange, a heavily used urban corridor, a suburban neighborhood, a town bypass, and/or a tolled freeway. Each team will design the best features (e.g., interchange type, cross slope, ramp locations, turn radii, sight distances, and path widths) they can into their project, subject to cost, safety, demand, emissions, noise, maintenance and/or other considerations. The design project will constitute a significant component of the course, and final team scores will be

individually adjusted to reflect student evaluations of teammates.

Students will undergo a multi-stage iterative design process in the development of their project. This will consist of three major phases: 1) A *preliminary project proposal*, outlining the proposed project and scope of work; 2) an *intermediate analysis and design report*, including a comprehensive project alternative analysis and preliminary design work; and 3) a *final project design*. Students will be responsible for peer-review of other teams' intermediate reports and will be graded based upon their feedback and insight. Students will be expected to address issues in their proposals and intermediate reports as noted by the instructor, TA and other students. An oral presentation (before several practicing engineers) and a written report of the design project will be completed by each student team for the final project design portion of this course.

*Note: This course carries the **Independent Inquiry** flag. Such courses are designed to engage students in the process of inquiry over the course of a semester, providing them the opportunity for independent investigation of a question, problem, or project. Hence, a substantial portion of this class' grade (40%) comes from independent investigation, project design, and presentation of student work, via the course's design project activities.*

### **VIII. Text/Reader and Course Notes**

The Course Packet can be purchased at Canopy Course Notes, located at Whitis and 20th (behind Players), 512-497-6662. The Packet consists of selected pages from Garber and Hoel's (G&H's) *Traffic and Highway Engineering* (Fourth Edition, 2009), which thoughtfully presents all key ideas present in AASHTO's "Green Book" – or *Policy on Geometric Design of Highways and Streets* (including all key tables for horizontal and vertical alignment designs). The Packet also contains some Green Book content & several sections of the *Highway Safety Manual*. Lecture slides are available online as well, (at Blackboard, rather than at [www.ce.utexas.edu/prof/kockelman/public\\_html/ce367lecture1\\_5.pdf](http://www.ce.utexas.edu/prof/kockelman/public_html/ce367lecture1_5.pdf), [ce367lecture6\\_10.html](http://www.ce.utexas.edu/prof/kockelman/public_html/ce367lecture6_10.html), [ce367lecture11\\_15](http://www.ce.utexas.edu/prof/kockelman/public_html/ce367lecture11_15.pdf), [ce367lecture16\\_20](http://www.ce.utexas.edu/prof/kockelman/public_html/ce367lecture16_20.pdf), & [ce367lecture21+.pdf](http://www.ce.utexas.edu/prof/kockelman/public_html/ce367lecture21+.pdf)) for students to print (double-sided is best). Other valuable reading may include additional content from the new Highway Safety Manual (HSM), AASHTO's Green Book, the PET Guidebook, and the Transportation Research Board's Highway Capacity Manual (HCM). Some reading assignments listed below are found on-line at the Victoria Transport Policy Institute (VTPI) <http://www.vtpi.org/tca/>

### **IX. Course Content & (Tentative) Outline of Topics and Order of Presentation**

CE 367G covers various aspects of transportation relating to the design of ground-based transportation systems (emphasizing roadway and non-motorized travel). The course *objectives* are that students are able to design safe, cost-effective, and sustainable networks, are familiar with design standards, and are comfortable with various tools for project evaluation. Primary topics include physical design for safe and efficient transport to meet passenger and freight needs, multi-modal and multi-objective planning, crash prediction, cost considerations, environmental impacts, and operational analysis. A great variety of other topics apply as well. A tentative scheduling of the course topics is shown below.

<b>Lesson # &amp; TOPICS TO BE COVERED</b>	<b>Relevant Reading in G&amp;H, AASHTO's Green Book (GB), &amp; VTPI website</b>
1 Introduction of Course	G&H Ch. 1 & 2: pp. 3-52
2 Methods for Evaluating Transportation Alternatives: Engineering Economics	G&H Ch. 13: 653-684
3 Anticipating Project Costs	VTPI's Transport. Cost & Benefit Analysis: Ch 5.6 at <a href="http://www.vtpi.org/tca/">http://www.vtpi.org/tca/</a>
4 Sight Distance Calculations: Stopping, Passing and Decision	G&H Ch. 3: pp. 88-94, & Ch. 7: pp. 301-320; GB: 3-1 to 3-18, 3-106 to 3-111, 9-28 to 9-54
5 Horizontal Alignment Design: Circular Curves & Superelevation	G&H Ch. 15: pp. 770-783; GB: 3-18 to 3-58
6 Design of Superelevation Development	G&H Ch. 15: pp. 783-787; GB: 3-59 to 3-84
7 Vertical Alignment Design	G&H Ch. 15: pp.756-770; GB: 3-149 to 3-164
8 Design of Roadway Cross Sections & Roadsides	G&H Ch. 5: pp.195-200, & Ch. 15: pp.745-754; GB: 4-1 to 4-36
<b>*** Exam 1 ***</b>	
9 Complete Streets, Context-Sensitive Design, and Pedestrian Facilities	G&H Ch. 5: pp.203-208; GB: 4-56 to 4-74 <u>ITE Journal Sept 2011 articles: (1) Walkable Urban Thoroughfares &amp; (2) Roundabouts as Context Sensitive Solns</u>
<b>*** Design Project Overview ***</b>	
10 Intersection Design	G&H Ch. 7: pp.265-322; GB: 9-55 to 9-114
11 Interchange Design	G&H: Ch. 8: pp.327-378; GB 10-1 to 10-62
12 Anticipating Crash Counts & Severity as a Function of Design Decisions	G&H Ch. 5: pp. 151-208, plus <u>Highway Safety Manual</u> pages in course reader
13 Key Traffic Variables for Evaluating System Level of Service	G&H Ch. 6: pp.213-258, & Ch. 9 & 10: pp. 381-528
<b>*** Exam 2 ***</b>	
14 Regulatory Controls Impacting Transportation Project Plans	G&H Ch. 11: pp. 551-586
Thur., May 8, 2 to 5:00pm <b>Final Presentations</b>	

### **X. Add/Drop Dates**

From the 1st through the 12th class day, an undergraduate student can drop a course via the web and receive a refund, if eligible. From the 13th through the university's academic drop deadline, a student may Q drop a course with approval from the Dean, and departmental advisor. After the academic drop deadline has passed, a student may drop a course only with Dean's approval, and only for urgent, substantiated, non-academic reasons.

For graduate students: From the 1st through the 4th class day, graduate students can drop a course via the web and receive a refund. During the 5th through 12th class day, graduate students must initiate drops in the department that offers the course and receive a refund. After the 12th class day, no refund is given. No class can be added after the 12th class day. From the 13th through the 20th class day, an automatic Q is assigned with approval from the Graduate Advisor and the Graduate Dean. From the 21st class day through the last class day, graduate students can drop a class with permission from the

instructor, Graduate Advisor, and the Graduate Dean. Students with 20-hr/week GRA/TA appointment or a fellowship may not drop below 9 hours.

## **XI. Evaluation Plan**

An evaluation of the course and instructor will be conducted at the end of the semester using the approved UT Course/Instructor evaluation forms. All students are encouraged to submit written comments during this survey, and beforehand (directly to the instructor, but anonymously), at any time.

## **XII. Other Information**

1. The University of Texas at Austin provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259 (voice) or 232-2937 (video phone) or <http://www.utexas.edu/diversity/ddce/ssd>.
2. According to The General Information Catalog “a student who is absent from a class or examination for the observance of a religious holy day may complete the work missed within a reasonable time after the absence, if proper notice of the planned absence has been given”. A student who misses classes or other required activities, including examinations, for the observance of a religious holy day should inform the instructor as far in advance of the absence as possible, so that arrangements can be made to complete an assignment within a reasonable time after the absence.
3. Students in CE367G are encouraged and authorized to work on homework assignments together and prepare for exams together. However, all written work handed in by a student is considered to be his/her own work, prepared without unauthorized assistance. To ensure your actions never compromise your and our class’s integrity, please visit [http://deanofstudents.utexas.edu/sjs/acint\\_student.php](http://deanofstudents.utexas.edu/sjs/acint_student.php) to see information regarding **Academic Integrity** and the **University Honor Code**. Students who violate University rules on scholastic dishonesty (e.g., anything which gives unfair academic advantage to a student) are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. An “F” grade will be the recommended penalty in most cases of scholastic dishonesty. One should refer to the Student Judicial Services website at <http://deanofstudents.utexas.edu/sjs/> to access the official University policies and procedures on scholastic dishonesty. For further elaboration on what constitutes scholastic dishonesty see [http://deanofstudents.utexas.edu/sjs/scholdis\\_whatdis.php](http://deanofstudents.utexas.edu/sjs/scholdis_whatdis.php)
4. Math & statistics tutors and other learning assistance can be obtained via many resources. (See, e.g., <http://www.engr.utexas.edu/undergraduate/97/4668-tutoring-information> & the Academic Community Center at Jester West: <http://www.engr.utexas.edu/undergraduate/services/tutoring/jester>.)