Intersection Traffic Operations

There are three basic types of intersections, each defined by the type of control that is used: (1) signal controlled, (2) stop or yield sign controlled, and (3) uncontrolled. Each intersection type is most appropriately used for a given set of traffic volume and intersection geometry conditions. During this class, we will study the first two types, intersections that are controlled by traffic signals and stop or yield controlled intersections (such as all-way stop controlled intersections, two-way stop controlled intersections, and roundabouts).

Traffic operations analysis is a major focus of work for the transportation engineer. Engineers today are more likely to redesign or upgrade an existing facility than to prepare a design for a new facility. This emphasis requires the transportation engineer to have a thorough understanding of the dynamics of traffic operations and the basic elements of traffic flow. To help you to gain this understanding, we will investigate traffic operations of unsignalized and signalized intersections as part of this course.

The expanded theoretical knowledge base of traffic flow at unsignalized and signalized intersections and the powerful computer software and hardware systems now widely available have combined to improve the capability of a very important tool for the transportation engineer, the computer model. Computer models are much more crucial today since the kinds of problems that transportation engineers are required to solve are much more complex than in the past. You will first learn the basic theory and calculation methods for the various kinds of intersection control. Then you will see how these theories and methods are included as the basis for the computational procedures of the Highway Capacity Manual 2010. Finally, you will apply these procedures in a set of case studies of intersection operations.

The level of traffic congestion in many urban areas has increased significantly from previous years. The peak hour is now in many cases the peak three hours, with congested conditions often affecting not just one intersection, but entire arterials and networks. Thus, the engineer must account for conditions not just in one place (at one intersection) or one point in time (the standard 15-minute analysis period), but over large blocks of both time and space.

Learning Objectives

1. Explain and apply theoretical queuing models for each of the intersection types in the Highway Capacity Manual.
2. Apply the Highway Capacity Manual models for intersections using both spreadsheet applications and the Highway Capacity Software.
3. Evaluate intersection conditions and make judgments about intersection operation and performance using the Highway Capacity Software.

Meeting Times

Mondays, Wednesdays, Fridays, 930 am, Engineering/Physics 110

Instructor Information

Michael Kyte, Ph.D., P.E., Professor, Civil Engineering
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Office Hours: [To be determined]

Prerequisites

CE372 or equivalent, or consent of instructor. CE 474 preferred.

Requirements

Your grade in this class will be determined by your performance in completing assignments, participating in class discussions, and the quality of your work on examinations. The table below lists the weight for each of the factors that will determine your final grade. These weighting factors are approximate and I reserve the right to give a final grade based on these factors and my overall assessment of your performance during the course.

- Assignments/class discussions (15 percent)
- Quizzes (15 percent)
- Paper reviews/writing assignments (20 percent)
- Examinations (25 percent)
- Case study (25 percent)

Assignments will be made and collected periodically. You will be expected to turn in these assignments when they are due. You will be expected to be able to present your results from an assignment in class. However, the assignments themselves may not always be graded.

Expectations

I expect you to behave in class in a civil manner that will support the learning of all students in the class, and that you understand the University of Idaho's Code of Student Conduct. I expect that you understand the concept of plagiarism and why it is important to give credit as appropriate to any source that you use as part of your course work. I also expect that you will focus on the work that we do during class and not use cell phones or computers (except as authorized), and not bring food to or eat during class.

Learning styles

We all learn in different ways. Some people prefer a strict lecture format in which the instructor presents new material during each class session. Other people prefer a more participatory style in which students take an active role during the class. I believe that a combination of both styles is appropriate. Sometimes, I will present new information in a lecture-style format. I will endeavor, however, to make these kinds of presentations as open as possible, asking questions as I go along. At other times, you will have problems to work on in a small group, giving you a chance to more actively (and deeply) learn the material.

Group Work

It is increasingly common for engineers to work together in a cooperative manner on design and analysis projects. Thus, problem solving in small groups helps to provide you with more of the experience of learning to work effectively with others and learn how to communicate your ideas and concepts to others. I will attempt to facilitate this more active, cooperative learning as much as possible.

Communications

I can’t emphasize enough the importance of clear communications, either in group discussions, in oral presentations, or in written reports. To give you more experience in this important area, I will periodically ask you to present the results of your homework assignments to the class. I will try to give you clear instructions on my expectations for each of your assignments. Give yourself the time to both complete the technical portion of the assignment and to communicate your results clearly and effectively.

Assessments

I will conduct assessments periodically during the semester so that I can get a better idea from you regarding how I'm doing my job. Constructive, thoughtful feedback is very much appreciated!

Schedule

Week	Dates	Topic
Part 1. Intersection Models: Basic Theory and Calculation Methods		
1	16 January (F)	Course overview
2	21 January (WF)	AWSC intersections
3	26 January (MWF)	AWSC/TWSC intersections
4	2 February (MWF)	TWSC intersections
5	9 February (MWF)	Roundabouts/Signalized intersections
6	18 February (WF)	Signalized intersections
7	23 February (MWF)	Signalized intersections
8	2 March (MWF)	Signalized intersections
Part 2. Highway Capacity Manual (HCM) Models: Applications and Analysis		
9	9 March (MWF)	Applications and analysis
10	23 March (MWF)	Applications and analysis
11	30 March (MWF)	Applications and analysis
12	6 April (MWF)	Applications and analysis
13	13 April (MWF)	Applications and analysis
Part 3. Case Studies (Highway Capacity Manual Applications Guide)		
14	20 April (MWF)	HCM Applications Guide: Case study
15	27 April (MWF)	HCM Applications Guide: Case study
16	4 May (MWF)	HCM Applications Guide: Case study