

Course Number	CE 459/559 Winter Quarter 2009
Title	Transportation Operations
Section	010
CRN(s)	45836/45844
Credits	4
Design Credits	2
Prerequisite(s)	CE 351. CE 454 Recommended.
Days/Time	MW 1200-1350
Location	EB 310
Final Exam Day/Time	Thursday March 19, 2009 1230-1420 in EB 310

Course Website	http://web.pdx.edu/~bertini/courses/559/559.htm . A substantial amount of material will be made available to you via the course website (including this syllabus). As the quarter progresses, I will post presentations, homework solutions and relevant links.
Course Wiki	http://wiki.cecs.pdx.edu/bin/view/Main/OpsCourse

Instructor	Dr. Robert L. Bertini, P.E.
Office	EB 301A
Phone	503-725-4249
E-mail	bertini@pdx.edu
Office Hours	TBA 301A EB Instructor is available at other times by appointment. You're encouraged to call, email and stop by the office if you need assistance of any kind in this class, other classes, developing your resume, finding internships, jobs, etc.
Mailbox	CEE, EB 200 & OTREC, EB 300

- Required Text:**
1. *Traffic Flow Fundamentals*, Adolf D. May, Prentice Hall, 1990.
 2. *Methods of Analysis*: http://web.pdx.edu/~bertini/courses/559/methods_of_analysis.pdf
 3. *Traffic Flow and Capacity*:
http://web.pdx.edu/~bertini/courses/559/flow_and_capacity.pdf
 4. *Traffic Flow Theory Monograph*:
http://www.tft.pdx.edu/docs/revised_monograph_2001.pdf
 5. *FHWA Traffic Analysis Toolbox*: <http://ops.fhwa.dot.gov/trafficanalysistools/toolbox.htm>
 6. *Other handouts distributed in class*

Catalog Course Description: *Operation, modeling and control of unscheduled and scheduled transportation modes; elementary traffic flow concepts; flow, density and speed; scheduling; route and bottleneck capacities; networks; data interpretation; analysis techniques: diagrams; simulation; queuing; optimization.*

This course focuses on developing and understanding of transportation operations with a multimodal theme and from first principles. The hope is that students will learn how to think about transportation problems with heightened insights. The class is organized into five modules: tools, traffic characteristics, analytical techniques, flow control, and flow scheduling. Students will work on approximately five problem concise problem sets (one per module), one group data collection project and one bottleneck analysis project, under the supervision of the instructor.

Course Objectives – Students must demonstrate the ability to:

- Understand the basic tools for planning, designing and evaluating multimodal transportation operations strategies.
- Be familiar with basic principles of flow theory.
- Understand the concepts of flow control.
- Comprehend issues related to observation of flows and design observation strategies.
- Undertake a team project involving data collection and analysis and understand the challenges and pitfalls of such an effort.
- Perform individual research, with proper citation of academic sources and communicate results to colleagues and instructor.

Course Requirements:

- Lecture materials and announcements.
- Assigned readings and individual presentations of reading assignments should be done prior to the relevant class.
- Problem sets to be done on one side of letter-sized (grid preferred) paper. Use plenty of paper, use legible block lettering, professional presentation standards and staple in the upper left corner.
- Group data collection project
- Individual simulation final project (oral presentation and brief written report).
- Attendance mandatory for the project presentations.
- Midterm and comprehensive final exams.
- All written responses in this course shall be in your own words.

Course Grading

Students will be evaluated on the following course components:

Assignment	Due	Percent of Total Grade
Homework and Reading Assignments	Throughout	30%
Simulation Proposal	January 21, 2009	2.5%
Midterm Exam	February 11, 2009	20%
Simulation Progress Report	February 16, 2009	2.5%
Final Exam	March 11, 2009	20%
Simulation Written Report	March 19, 2009	15%
Simulation Presentation	March 19, 2009	10%
TOTAL		100%

A curve will be used to determine the final course letter grade.

Disabilities

Students with disabilities should discuss any arrangements that will enhance their learning in this class with the instructor.

Professionalism

All assignments and class participation should be conducted in a professional manner. Attention to detail on class assignments and communication is important and is part of the learning experience in this course.

Incompletes

A grade of "I" is granted by the instructor *only* with prior approval and consent. Criteria are outlined in the PSU Bulletin.

Program requirements

The CEE Department requires that junior and senior engineering courses must be completed with a minimum grade of C-, and a student's cumulative PSU GPA must be 2.25 or higher to graduate from the BSCE program.

Tentative Schedule (Subject to Modification)

No.	DATE	TOPIC	TEXT READING ASSIGNMENT
1	1/5	♦ Course overview and introduction	
2	1/7	Guest Speaker TBA ♦ Vehicle trajectories ♦ Time space diagram	
3	1/12	No Class Today – Work on Projects	
4	1/14	Guest Speaker TBA ♦ Input-output diagram ♦ Queueing	
5	1/19	MLK HOLIDAY (University closed)	
6	1/21	<i>Simulation Project Proposal Due</i> ♦ Optimization ♦ Introduction to traffic flow theory	Methods of Analysis
7	1/26	♦ Free flow relationships ♦ Forced regimes	Ch. 1
8	1/28	♦ Traffic dynamics ♦ Shockwaves	Ch. 2
9	2/2	♦ Stability ♦ Car following	Ch. 3
10	2/4	♦ Cyclic server theory ♦ Actuated control	Ch. 4
11	2/9	♦ Serial systems ♦ Networks	Ch. 5
12	2/11	<i>Midterm Exam</i>	
13	2/16	<i>Simulation Project Progress Report Due</i> ♦ Probability ♦ Poisson process	Ch. 6
14	2/18	♦ Simulation ♦ Estimation	Ch. 7
15	2/23	♦ Capacity estimation ♦ Measuring traffic states	Ch. 9
16	2/25	♦ Diagram observation ♦ Moving observers	Ch. 10
17	3/2	♦ Dispatching, delay ♦ Schedule control	Ch. 11
18	3/4	♦ Data gathering ♦ Area-wide sketch planning	Ch. 12
19	3/9	<i>Special Topics</i>	Ch. 13
20	3/11	<i>Final Exam</i>	
21	3/19	<i>Thursday 1230-1420 in EB 310</i> <i>Simulation Report Due & Student Presentations</i>	

Chapter Reading Assignments

The chapter reading assignments shown on the syllabus provide important background information that will be expanded upon in class via lectures, other assigned reading, homework assignments and a project. For each chapter, a student or students will be assigned to prepare a one page summary of their chapter for presentation to the class. All other students should prepare a question from that chapter to ask the presenter.

Simulation Project

A professional presentation and short paper based on an individual simulation application project is required as an integral part of this course. The topic will be selected in close consultation with the instructor. The goal will be to identify a simulation tool (either macroscopic or microscopic), create a relatively simple network, and calibrate/validate the network using at least one hour's "real" data containing a peak period. The student is required to interactively learn the basic functions of the chosen simulation tool, create and load the network, and summarize the calibration/validation performance results in a short written report and a professional presentation given to the class and instructor. The simulation project will be developed as follows:

- | | |
|------------------------|--|
| ▪ January 5 & 14, 2009 | Discussion of possible project tools and data sources. |
| ▪ January 21, 2009 | Simulation project proposal due. |
| ▪ February 16, 2009 | Simulation project progress report due. |
| ▪ March 19, 2009 | Simulation project presentation and report due |

In choosing a simulation tool you should review the "Traffic Analysis Tools by Category" handout, also available from the FHWA website:

<http://ops.fhwa.dot.gov/trafficanalysistools/toolbox.htm>

You may choose any tool, but several would be preferable since we have them available in the ITS Lab or are readily available free on the Internet:

- ♦ Paramics
- ♦ Vissim
- ♦ Synchro
- ♦ HCS
- ♦ FREQ
- ♦ Netcell (http://www.ce.berkeley.edu/~daganzo/software_and_data.htm)
- ♦ VISTA

You should think about choosing an appropriate simple network where input data is available. Some examples might include:

- ♦ Signalized intersection with transit priority
- ♦ Pair of signalized intersections
- ♦ Stop controlled intersection
- ♦ Arterial with signalized intersections and bus rapid transit
- ♦ Freeway segment with merge/diverge
- ♦ Freeway corridor with transit
- ♦ Diamond interchange

You will need to use your own initiative and creativity to find appropriate data sources for the network (try Google's mapping tools with aerial photos) and traffic volumes (try PORTAL, and other contacts at the City of Portland or other transportation professionals). Your instructor will assist after you do some initial legwork.

Simulation Project Proposal

Your proposal is due on January 21, 2009 and is limited to **two pages** (typed/word processed) and shall include the following:

- Your name
- Paper title
- Simulation tool chosen
- Network type or site chosen
- Specific **objectives** in bullet format (where you're going)
- Preliminary outline of paper, in table of contents format (how you're going to get there)
- Evidence of preliminary research. This should include evidence that you have at least logged into the simulation tool, and have made an initial stab at selecting a network and finding a data source.
- Attach a printout of a screen shot showing you have actually logged into the simulation tool you have chosen.

Introduction to Library and Literature Research

With the advent of the Internet it is very tempting to think that all necessary resources for a term project will be available in full text after typing in a few words at Google.com. This notion should be discarded immediately. We will discuss the concepts of library and literature research, involving your need to access real books and articles contained in refereed/archival journals. You will need to use real library search tools and will also need to go to the library and physically touch some sources of information.

Note that for this course transportation textbooks and web sites do not count as library references. Several good sources for finding transportation journal articles and other documents are:

- National Transportation Library www.bts.gov/NTL
- TRIS Online <http://ntl.bts.gov/tris>
- Melvyl index www.melvyl.ucop.edu

NOTE: Library references for most relevant documents will be provided as output from your searches using these tools. You will have to actually look up the document in the PSU library or request it through interlibrary loan.

Be sure to make use of the Vikat catalog, go to the PSU library home page at <http://vikat.pdx.edu>. Also available on the library home page <http://www.lib.pdx.edu> are Full Text Electronic Journals: <http://www.lib.pdx.edu/~bvws/bytitle.html>, and a list of on-line Databases: <http://www.lib.pdx.edu/resources/databases/databases.html>. Try EI Compendex (<http://www.ei.org/ev2/ev2.home>) and Lexis-Nexis. Note that access to these databases is free for PSU students, but you must be using a computer on campus or via a dial-in service. See <http://www.lib.pdx.edu/services/distance/proxyserver.html> for instructions on how to gain off-campus access using a proxy server.

Presentation Format for Submittal

Please follow the Transportation Research Board (TRB) procedures for preparing your presentation: http://www4.nas.edu/trb/annual.nsf/web/information_for_authors. Minimum requirements for the presentation are:

- Submittal should consist of approximately 20 Powerpoint slides that fully describes your simulation project.
- Student will upload presentation to course wiki.
- Where text is used use clearly legible type appropriate for presentation according to TRB.
- All exhibits, tables, figures, charts, appendices, should be labeled, with sources properly cited.

- One-inch top, bottom, left, and right margins are recommended, number pages in lower right corner.
- Include a title page, abstract, body of presentation, acknowledgements and list of specific references cited in the presentation.
- Do not use any special binding—just staple in the upper left hand corner.
- Avoid jargon, acronyms, and use of personal pronouns in your presentation.
- Each student must prepare an individual presentation.

References

- The reference list shall include only those references cited in the text; number them in the reference list in the order they are first cited in the text.
- Denote a reference at the appropriate place in the text by an underlined or italic arabic numeral in parentheses, e.g., (2).
- Do not repeat a reference in the list and do not use *ibid.*, *idem*, *op. cit.*, or *loc. cit.* If a reference is cited more than one time in the text, repeat the number first assigned to the reference.
- Do not use footnotes to the text. Incorporate such notes within the text.

Use the TRB style found at:

http://www4.nas.edu/trb/annual.nsf/web/information_for_authors#References

The following are some samples of the basic style for references:

Sample Reference Style for TRB Publications:

V. Zahavi and J.M. Ryan. Stability of Travel Over Time. In *Transportation Research Record 750*, TRB, National Research Council, Washington, D.C., 1980, pp. 70-75.

Sample Reference Style for Book:

D. Shinar. *Psychology on the Road: The Human Factor in Traffic Safety*. John Wiley and Sons, Inc., New York, 1978.

Sample Reference Style for Periodical:

J.K. Jolliffe and T.P. Hutchinson. A Behavioral Explanation of the Association Between Bus and Passenger Arrivals at a Bus Stop (in Japanese). *Transportation Science*, Vol. 9, No. 3, May 1975, pp. 248-282.

Sample Reference Style for Government Report:

B.J. Dempsey. *Climatic Effects of Airport Pavement Systems: State of the Art*. Report DOT2DRD-75-196. FHWA, U.S. Department of Transportation, 1976.

Submitted Presentation Evaluation

You will be evaluated on your submitted presentation as follows:

- Introduction/Background - 10 %
- **Objectives** - 10 %
- Body and Quality of Research Tools Used - 40 %
- Conclusions/Recommendations/Perspective - 20 %
- Language/Style - 10%
- Overall Impression - 10%

Presentation

Attendance

All students are required to attend all paper presentations. This should be looked upon as an opportunity to gain experience making a professional presentation in a supportive environment, among your peers. You will be evaluated on your presentation content, style and skills.

Delivery

The primary contributors to an effective presentation are (a) technical content, (b) visual aids, and (c) skills of the speaker. Remember that a presentation may (should) differ from the printed paper and that the presentation gives the author an opportunity to discuss and

emphasize highlights of the work, which may not be possible to do in the printed version. It is recommended that you think towards structuring your presentation as follows:

- Title
- **Objectives**
- Outline of Presentation
- Methodology
- Body
- Summary
- Conclusion
- Perspectives

Do not read the paper or presentation. Practice to become completely familiar with your presentation so that you can speak from memory or notes. Concentrate on your delivery. Speak clearly and at a pace somewhat slower than normal conversation. Avoid a monotone. Can you be heard throughout the room, and are you facing your audience, instead of looking at the visual aids?

Timing

Your presentation will be limited in time (to be determined). Most people are surprised when their time is up! It is very helpful if you practice your talk beforehand, keeping track of elapsed time. Recognize that actual presentations usually take longer than rehearsals. Help your audience by not exceeding your allotted speaking time.

Visual Aids

Visual aids are always effective tools for communicating your ideas quickly, and therefore are recommended. An overhead projector will be available. Do not consider using the white/chalk board as a substitute for visual aids. Please do not use all text visuals that convey no additional information to the audience. A maximum of one or two visuals should be used per minute of presentation. The instructor will be happy to assist you in the development of visual aids.

Computer and Email Accounts

All engineering students should activate their engineering computer account (go to the CadLab in EB 325A) which will allow them to use engineering computer labs and email. You should activate it *before* the day you need it. If you encounter problems with this account, see the lab attendant, or email: support@cat.pdx.edu. Please note: the CEE Department regularly sends course announcements, job information, etc. to students' MCECS accounts, so if you do not check it regularly, we recommend forwarding your CECS e-mail to whatever e-mail address you use. You can also activate your Odin (PSU) account. See <http://www.uss.pdx.edu/>.

Ethics and Professionalism

Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the engineering profession.

The PSU Student Conduct Code prohibits all forms of academic cheating, fraud, and dishonesty. Further details can be found in the PSU Bulletin. Allegations of academic dishonesty may be addressed by the instructor, and/or may be referred to the Office of Student Affairs for action. Acts of academic dishonesty may result a failing grade on the exam or assignment for which the dishonesty occurred, disciplinary probation, suspension or dismissal from the University. The students and the instructor will work together to establish optimal conditions for honorable academic work. Questions about academic honesty may be directed to the Office of Student Affairs (<http://www.ess.pdx.edu/osa/>).

Student Groups and Professional Organizations

Participation in student and professional groups can be a valuable part of your education experience. Membership gives students opportunities to get to know fellow students better, meet and network with professionals, collaborate in solving real engineering problems, learn about internship or job possibilities, socialize and have fun. Your fellow students can be a great source of help and guidance in your academic endeavors. Consider becoming active with a student organization, such as the following:

- American Society of Civil Engineers Student Group (ASCE): <http://www.asce.pdx.edu>
- Students in Transportation Engineering and Planning (STEP)/Institute of Transportation Engineers (ITE) Student Chapter: <http://web.cecs.pdx.edu/~step/>.

Most professional organizations have monthly meetings and encourage student participation by providing discounts for lunch and dinner meetings. These meetings provide opportunities to network with potential future employers, learn about scholarships, and increasing your technical knowledge. Take a look at these organizations as a starting point:

- American Society of Civil Engineers (ASCE) Oregon Section: www.asceor.org
- Institute of Transportation Engineers (ITE) Oregon Section: www.oregonite.org
- Women's Transportation Seminar (WTS) Portland Chapter: http://wtsinternational.org/sub.php?section=chapters§ion_id=05.00&chapter_id=24
- Society of Women Engineers (SWE) Columbia River Section - <http://www.swe-columbia-river.org>
- Structural Engineers Association of Oregon (SEAO): www.seao.org

Resources

As a PSU student, you have numerous resources at your disposal. Please take advantage of them while you are here. A small sample is listed below:

- CEE Website (includes program info, job listings, etc.): <http://www.cee.pdx.edu>
- CEE Website Job Listings: http://www.ce.pdx.edu/ce_jobs.shtml
- Career Center: <http://www.career.pdx.edu/>
- Academic Advising: <http://www.pdx.edu/advising>
- Center for Student Health & Counseling: <http://www.shac.pdx.edu/>
- The Writing Center: <http://www.writingcenter.pdx.edu/>
- PSU Disability Resource Center: 435 Smith Memorial Union
- Portland CE firms and agencies: <http://web.pdx.edu/~bertini/resources.html>

Many students have internships, summer jobs, etc., so if you have any questions about how to begin the employment search please let me know.

Note: The PSU Disability Resource Center is available to help students with academic accommodations. If you are a student who has need for test-taking, note-taking or other assistance, please visit the DRC and notify the instructor at the beginning of the term.

Campus Safety

The University considers student safety paramount. The Campus Public Safety Office is open 24 hours a day to assist with personal safety, crime prevention and security escort services. Call 503-725-4407 for more information. For Campus emergencies call 503-725-4404 (from campus phones dial 5-4404). To dial 911 from a campus phone, you must dial 9-911.