University of Nevada, Las Vegas
Howard R. Hughes College of Engineering

CEE 795 – 002: Transportation Network Analysis

Tuesday – Thursday
5:30 – 6:45 PM
CBC C223

CLASS SYLLABUS – Fall 2009

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TBE – B 370
http://faculty.unlv.edu/apaz/

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OFFICE HOURS:

Tuesday – Thursday
3:30 – 5:00 PM
COURSE DESCRIPTION

This course covers concepts fundamental to the planning, design, operation, and management of transportation networks. It seeks to impart a systems perspective to address transportation network problems. That is, a transportation network should be viewed as a unified whole to be evaluated considering its intrinsic spatio-temporal interactions rather than just the local effects of a particular action. Transportation network analysis is a multidisciplinary field that incorporates concepts from engineering, economics, operations research, probability and statistics, management, psychology, and public policy analysis. This course provides the basic analysis framework, standard algorithms for transportation network analysis, and practical hands on analysis of real-world problems using state-of-the-art modeling and analysis tools. Topics include the basic supply-demand microeconomic framework, analysis of transportation demand, analysis of transportation network performance, network equilibrium, and an associated semester-long project.

COURSE MATERIAL

The course will be taught using material from various books and journal papers. Some required reading material will be placed on the course WebCampus website. The primary references contain material directly relevant to the course. The other references contain material of broader interest to the course. Several software packages will be use to further enhance concepts, apply gained knowledge, and address real-world problems.

REFERENCES

Primary:

Other:


PREREQUISITES

Undergraduate calculus, basic probability.

STUDENT EVALUATION

Students will be assessed in the course based on four (5) activities:

**Attendance:** Students are expected to attend classes and credit will be given for class participation. This includes students asking and answering questions. In addition, students are expected to bring to class related issues and experiences. This will provide opportunities to enhance class goals (more information will be provided in class).

**Reading and assignments:** The reading and assignments are fundamental to obtain the expected outcomes. Students are expected to check class schedule and read the appropriate material before class. This will help understanding class lectures.

**Class Presentations:** There will be various class presentations that you will be giving throughout the semester. The objective of these presentations is to help students enhance their oral skills. Specific details will be provided in class.

**Midterm:** The midterm will include fundamental transportation network analysis topics. A significant portion of the midterm will include questions and problem explicitly related to the final project. Hence, it is very important that every student participate in every aspect of the project. (more information will be provided in class).

**Final Project:** Students will be required to work in teams on a semester long project. This will be the FINAL ASSESSMENT and is VERY important. This should demonstrate how well students are prepared to perform transportation network analysis. Students will also be required to make a 45-60 minutes presentation of the project. Each student must be able to address any question relevant to the project. That is, student must know what has been done to address the entire project. More information is provided below.
GRADING

- Attendance and class participation 15 %
- Reading and assignments 15 %
- Midterm 15 %
- Class presentations 15 %
- Final project 40 %

ACADEMIC ETHICS

Ethics in this course are very serious:

1. If a student is found cheating on an exam, he/she will receive an F in this course.
2. As I stated earlier, students can work in groups to do the homework, but each student is responsible for his/her own work. Students that hand in nearly identical homework will not receive credit for that assignment.
3. Academic Misconduct – “Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV’s function as an educational institution.”
   An example of academic misconduct is plagiarism: “Using the words or ideas of another, from the internet or any source, without proper citation of the sources.” See the “Student Academic Misconduct Policy” (approved December 9, 2005, located at <http://studentlife.unlv.edu/judicial/misconductPolicy.html>).
4. Copyright - The University requires all members of the University Community to familiarize themselves and to follow copyright and fair use requirements. YOU ARE INDIVIDUALLY AND SOLELY RESPONSIBLE FOR VIOLATIONS OF COPYRIGHT AND FAIR USE LAWS. THE UNIVERSITY WILL NEITHER PROTECT NOR DEFEND YOU NOR ASSUME ANY RESPONSIBILITY FOR EMPLOYEE OR STUDENT VIOLATIONS OF FAIR USE LAWS. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. To familiarize yourself with copyright and fair use policies, you are encouraged to visit the following website: <http://www.unlv.edu/committees/copyright/>.

CLASS ATTENDANCE

Students’ attendance to class is highly recommended. Some of the lectures and assignments will deal with material that is not in the text. We will also be doing many classroom activities. Please inform the instructor if you intend to miss a lecture for personal reasons.

COURSE WEBSITE AND EMAIL

WebCampus will be highly utilized to post course material. Please see https://webcampus.nevada.edu for instructions on logging into your account. In accordance with UNLV policy, all students are to be contacted using their UNLV email. (user_name@unlv.nevada.edu). This will be the email address that
I use. If you don’t know your email address, then go to http://rebelmail.unlv.edu/. Do **NOT** use the e-mail tool provided in WebCampus, instead use your UNLV e-mail address.

**DISABILITY RESOURCE CENTER:**

The Office of the Executive Vice President and Provost and Faculty Senate have endorsed the following statement to be included in all course syllabi. [NOTE: Over two-thirds of the students in the DRC reported that the syllabus statement, often read aloud by the faculty during class, directed them to the DRC office.]

The Disability Resource Center (DRC) coordinates all academic accommodations for students with documented disabilities. The DRC is the official office to review and house disability documentation for students, and to provide them with an official Academic Accommodation Plan to present to the faculty if an accommodation is warranted. Faculty should not provide students accommodations without being in receipt of this plan.

UNLV complies with the provisions set forth in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, offering reasonable accommodations to qualified students with documented disabilities. If you have a documented disability that may require accommodations, you will need to contact the DRC for the coordination of services. The DRC is located in the Student Services Complex (SSC), Room 137, and the contact numbers are: VOICE (702) 895-0866, TTY (702) 895-0652, FAX (702) 895-0651. For additional information, please visit: <http://studentlife.unlv.edu/disability/>.

**SUGGEST STRATEGY**

Students must complete and understand the homework. Students should not wait to clarify issues they did not comprehend regarding class or homework. There are no bad questions. Finally, students should take advantage of office hours. If a student has conflict with the suggested hours, the student must contact the instructor (phone or email) to set up an appointment. Please do not wait till the last moment to schedule an appointment. Only students requesting appointment in advance (at least one day) will be considered.

**FINAL PROJECT: Network Analysis for Operational Planning**

**Objective**

To expose the students to the modeling and analysis of large-scale transportation networks. The project involves understanding transportation demand and supply interactions so as to address real work problems using state-of-the-art modeling tools.

**Description**

This project requires the modeling and analysis of a real-world vehicular traffic network. State-of-the-art network analysis and evaluation tools will be used to model and analyze the performance of the vehicular traffic system under several scenarios. The objective of the project is to analyze several alternatives for accommodating trucks on urban freeways in Southern Nevada.
Team work

This is a semester-long project that requires a substantial amount of work. Hence, students will work in teams of two to three members each. The instructor will create the teams.

Network characteristics

Teams will model the Las Vegas metropolitan urban transportation network. The corresponding Travel Demand Model (TDM) will be provided. The TDM will be used as the starting point of the modeling and analysis activities.

Example:

This is a very simple example of a very small network with a major corridor and alternative routes.

Report

Each student will organize in a CD/DVD all the material used during the semester to complete the project. The CD/DVD will include all the input data files, graphs, summary of procedures, experiment designs, experiment results, analysis and answers to the questions formulated for this project. A copy of the CD/DVD will be submitted to the instructor at the end of the semester. We will use 5 to 15 minutes of the first day of class of each week (starting the second week of classes) to check progress, address issues and answer questions. Projects will be submitted on 12/08-10/2009 along with a 45-60 minutes presentation.

Preliminary activities

1) Read (scan) the software user manual to understand what data needs to be collected (and/or created).
2) Review the TDM.

3) Based on the TDM data, create the necessary input data files to model the network/scenarios.

4) Check for consistency.

5) Prepare a 15 minutes presentation to show the network characteristics and to demonstrate that the models are running. The presentations will be on 09/29/2009.

6) Create the set of alternatives to evaluate including:
   - Based case scenario
   - Truck restriction
   - Truck only lane
   - Truck only toll (sensitivity analysis (e.g., various toll policies))
   - Truckway toll (sensitivity analysis (e.g., various toll policies))

7) Analyze each of the alternatives.

8) Develop conclusions and recommendations.
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<thead>
<tr>
<th>Week</th>
<th>Class</th>
<th>Date</th>
<th>Subject [chapter and mandatory reading assignment; optional reading]</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>08/25</td>
<td>Introduction, [Sheffi 1; (Manheim 1; Sussman 1-3; Larson (Section 6.1))]</td>
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<td>2</td>
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<td>08/27</td>
<td>Urban Transportation Networks Analysis [Sheffi 1; Manheim 1]</td>
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<td>2</td>
<td>3</td>
<td>09/01</td>
<td>Dynamic Traffic Assignment Tutorial [DynusT Users’ guide]</td>
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<td>2</td>
<td>4</td>
<td>09/03</td>
<td>Transportation Supply [McShane 3; Garber5; Khisty 5; (Sussman 11)]</td>
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<td>3</td>
<td>5</td>
<td>09/08</td>
<td>Traffic Assignment (User Equilibrium) [Sheffi 2-5]</td>
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<td>4</td>
<td>6</td>
<td>09/10</td>
<td>Traffic Assignment (User Equilibrium) [Sheffi 2-5]</td>
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<td>7</td>
<td>09/15</td>
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<td>8</td>
<td>09/17</td>
<td>Traffic Assignment (User Equilibrium) [Sheffi 2-5]</td>
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<td>5</td>
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<td>09/22</td>
<td>Routing [Sheffi 5; Larson and Odoni 6]</td>
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<td>09/24</td>
<td>Routing [Sheffi 5; Larson and Odoni 6]</td>
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<td>6</td>
<td>11</td>
<td>09/29</td>
<td>Student presentations</td>
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<tr>
<td>7</td>
<td>12</td>
<td>10/01</td>
<td>User Equilibrium Extensions [Sheffi 6]</td>
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<td>13</td>
<td>10/06</td>
<td>Trip Distribution and Traffic Assignment [Sheffi 7]</td>
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<td>14</td>
<td>10/08</td>
<td>Equilibrium with Link Interactions [Sheffi 8]</td>
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<td>7</td>
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<td>10/13</td>
<td>NO CLASS (Instructor attending INFORMS, Study week)</td>
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<td>7</td>
<td>16</td>
<td>10/15</td>
<td>NO CLASS (Instructor attending INFORMS, Study week)</td>
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<tr>
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<td>10/27</td>
<td>Traffic Flow Simulation Models [FHWA traffic analysis toolbox 1-3]</td>
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<td>11/03</td>
<td>Discrete Choice Models [Ben Akiva 3, 5, 6; Train 1-2]</td>
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<td>11/05</td>
<td>Discrete Choice Models [Ben Akiva 3, 5, 6; Train 1-2]</td>
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<td>11/09</td>
<td>Discrete Choice Models and Traffic Assignment [Sheffi 10, Appendix]</td>
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<td>11/12</td>
<td>Stochastic Network Loading Models [Sheffi 10]</td>
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<td>22</td>
<td>11/17</td>
<td>Stochastic User Equilibrium [Sheffi 12]</td>
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<td>23</td>
<td>11/19</td>
<td>Analysis Inputs/Network Representation [Sheffi 13]</td>
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<td>NO CLASS (Thanksgiving Break)</td>
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<td>25</td>
<td>12/08</td>
<td>Final Presentations (final examinations)</td>
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<td>26</td>
<td>12/10</td>
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<td>12/08</td>
<td>Final Presentations (final examinations)</td>
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*(1) COURSE OUTLINE (subject to change)*