University of Colorado Denver  
College of Engineering & Applied Science  
CVEN 5612  
Traffic Impact Analysis

Class Information:  
Spring 2016  
T 5-7:50pm  
Location NC 2409  
Office Hours: M 10am-2pm or by appointment

Instructor Information:  
Roxann M. Hayes, PE  
Office: North Classroom 2605-C  
roxann.hayes@ucdenver.edu

Purpose  
This course introduces students to state and local requirements for transportation impact assessments. The course will focus on methods and procedures used to prepare transportation impact assessments for new developments, new roads and interchanges, highway expansion, and intersection improvements. Key impacts include peak and off-peak travel times, traffic control changes, queuing delays, geometric design changes, safety, parking availability, driveway access, fuel consumption, pollution, shift to both motorized and non-motorized modes, disabled access, and business development impacts.

The course will cover four-step modeling processes (trip generation, distribution, assignment, and mode choice) as applied to traffic impact analyses. The objective is for students to understand the principles of these methods and to gain experience in their application to traffic impact studies. The course will examine the appropriate use of trip generation rates published in the ITE Trip Generation Manual versus more specific survey data gathered for a particular area and type of development. We will also discuss equitable ways of assessing the burden of site generated trips with existing and projected traffic of existing or future developments.

Course Information  
The course mainly focuses on new development impacts to roadway traffic and levels of service in business and residential areas, including transit, bicycles and pedestrians. The required guidebook for the course is Transportation Impact Analyses for Site Development: An ITE Recommended Practice (ITE, 2010), which I refer to as the Guidebook.

Other readings will be from The Manual for Transportation Engineering Studies (ITE, 1994) by Robertson, Hummer, and Nelson. We will discuss several articles from the ITE Journal, the Transportation Research Record, and the ASCE Journal of Transportation Engineering as additional readings.
Guidebook
There is one required textbook for this course. Other readings essential for this course will be assigned each week and typically posted as .pdf documents on Canvas. Students are expected to have read the appropriate assignments prior to class so that the material can be discussed in a thoughtful manner.

Other texts will be referenced, including:

- Traffic Engineering (Fourth Edition)
  Roess, Prassas, McShane (Prentice Hall, 2011)

- 2010 Highway Capacity Manual (HCM2010)
  Current price $220.00

- Manual of Uniform Traffic Control (MUTCD)
  Available on-line for free

- Supplemental materials provided by instructor.

Course Requirements
Written requirements for the course include on mid-term in-class exam, seven subprojects, and a final course project. Part of each subproject is directed towards the completion of your final course project. The final course project is to develop a traffic impact assessment for a site in the Denver area or another city. The final course project provides the opportunity for students to perform a comprehensive traffic analysis with the above mentioned tools and procedures.

Each student must submit and present a final project report in order to pass the course.
Grading
Class attendance / Participation 10%
Homework/Assigned Projects 5% each (11 subprojects)
In-Class Exam 15%
Final Project 15%
Final Presentation 5%

The grading scale is as follows:
A 91.1 - 100%
A- 90.0 - 91.0%
B+ 89.0 – 89.9%
B 81.1 – 88.9%
B- 80.0 – 81.0%
C+ 79.0 – 79.9%
C 71.1 – 78.9%
C- 70.0 – 71.0%
D 60.0 – 69.9%
F lower than 60.0%

In terms of grading, mistakes do happen - so if I made one with grading any of your assignments, please contact me as soon as possible. I would also be more than happy to discuss the overall assignment or even the correct answers, but I will not consider requests to alter your grade unless there is an error.

Canvas
CU Online has migrated from the Blackboard and eCollege platforms to a new Learning Management System (LMS) called Canvas. We will be utilizing this LMS. You are expected to learn and understand the new system. Homework assignments may be submitted only through Canvas. Notifications for the course will be transmitted through Announcements in Canvas, so be sure your notifications are set appropriately to forward to your e-mail. If you have problems with your Canvas account, contact the help desk at help@cuonline.edu or phone 303.556.6505.

Calculators/Exams
During in-class exams, you be required to use a calculator approved for the Fundamentals of Engineering exam. Since it is required to take the FE in order to graduate from this program, you should be comfortable with this calculator. Therefore, I recommend you use it while working homework. In addition, during exams, phones will be turned off and stored in your backpack, which will be placed at the front of the classroom.
# Course Schedule (Tentative)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Subproject # Due</th>
<th>Subproject Description</th>
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<tbody>
<tr>
<td>1</td>
<td>19-Jan</td>
<td>Introduction to Course; Project Introduction and Synchro</td>
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<td></td>
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<td>Initiating a Traffic Impact Study: Guidebook Chapter 2</td>
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<td>2</td>
<td>26-Jan</td>
<td>Modeling Coordinated Traffic Signals in Synchro/Simtraffic</td>
<td>1</td>
<td>Description of Project and Location</td>
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<td></td>
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<td>Context and Framework: Guidebook Chapter 3</td>
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<td>3</td>
<td>2-Feb</td>
<td>Roadway and Site Inventories: Manual Chapter 6</td>
<td>2</td>
<td>Title Page; Vicinity Map; Synchro Initial Info</td>
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<td></td>
<td></td>
<td>Volume Counts and Adjustments: Manual Chapter 2</td>
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<tr>
<td>4</td>
<td>9-Feb</td>
<td>Gathering Traffic Volumes; CDOT’s OTIS</td>
<td>3</td>
<td>Adjacent Access Points; Site Access Location &amp; Configuration</td>
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<td></td>
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<td>Non-Site Traffic Forecast: Guidebook Chapter 4</td>
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<tr>
<td>5</td>
<td>16-Feb</td>
<td>20-Year Factor</td>
<td>4</td>
<td>Existing Traffic Volumes</td>
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<td></td>
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<td>Growth Factor</td>
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<td>6</td>
<td>23-Feb</td>
<td>Site Traffic Generation: Guidebook Chapter 5</td>
<td>5</td>
<td>Future Traffic Volumes / Total Traffic Volumes</td>
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<td>Environmental &amp; Legal Considerations in Traffic Impact Assessment</td>
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<td>7</td>
<td>1-Mar</td>
<td>Pass-By Trips and Diverted-Linked Trips</td>
<td>6</td>
<td>Trip Generation</td>
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<td>Access Management Guidelines for Activity Centers</td>
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<td>8</td>
<td>8-Mar</td>
<td>Traffic Distribution and Assignment: Guidebook Chapter 6</td>
<td>7</td>
<td>Pass-by Trip Generation</td>
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<td>AASHTO Procedures for Intersection Sight Distances</td>
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<tr>
<td>9</td>
<td>15-Mar</td>
<td>Pass-by Trip Generation</td>
<td>8</td>
<td>Trip Distribution</td>
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<td>AASHTO Procedures for Intersection Sight Distances</td>
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<td>10</td>
<td>22-Mar</td>
<td>SPRING BREAK - NO CLASS</td>
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<td>12</td>
<td>5-Apr</td>
<td>Overview of the State of Colorado Highway Access Code</td>
<td>9</td>
<td>Site Circulation &amp; Parking</td>
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<td>AASHTO Procedures for Left-turn Accelerate/Deceler Lengths</td>
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<td>13</td>
<td>12-Apr</td>
<td>Roadway Segment Analysis</td>
<td>10</td>
<td>Auxiliary Lanes</td>
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<td>Formulation of Mitigation Measures</td>
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<td>14</td>
<td>19-Apr</td>
<td>Traffic Accident Studies &amp; Countermeasures: Traffic Calm</td>
<td>11</td>
<td>Sight Distance Evaluation</td>
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<td>AASHTO Procedures for Intersection Sight Distances</td>
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<tr>
<td>15</td>
<td>26-Apr</td>
<td>EXAM (in class, open book)</td>
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<td>16</td>
<td>3-May</td>
<td>Presentations</td>
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<td>17</td>
<td>10-May</td>
<td>Finals Week - No Class</td>
<td>Final Paper</td>
<td>Conclusion</td>
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## Course Schedule

The course schedule is presented above. This is only a suggestion for the schedule. The instructor reserves the right to make changes to this schedule regarding homework assignments, the number of problems due, additional projects, and exam dates. Please check Canvas throughout the semester, as this will be the final schedule.
Subproject Assignments
The final course project is to develop a traffic impact assessment for a site in a town or city (not Denver), preferably more rural in nature. You will propose to place a “new” development on a currently vacant lot. This development can be any size or type (anything from a new restaurant, bank, apartment complex, etc.) – your choice.

Your selected project must be located on an existing CDOT roadway, and have data available on CDOT’s website. Your evaluation will assume the project will be built this summer, and future traffic will be evaluated in five years and twenty years from build-out date. The traffic impact study will evaluate either an AM and PM peak period, and a weekend peak period.

Generally, each subproject is due the day of class, at the beginning of class. It will be submitted via Canvas only as a .pdf. I will not accept late subprojects. However, your lowest score will be dropped. Each week you should add on to the previous subproject, eventually ending up with a final report.
### Subproject Descriptions

<table>
<thead>
<tr>
<th>Subproject #</th>
<th>Description</th>
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| 1            | **Description of Project and Location**  
Description of proposed development site or change in area’s road system including discussion of primary concerns and potential impacts. |
| 2            | **Title Page; Vicinity Map; Synchro Initial Info**  
Main title page with name, description of project, location of project, date final project is due. Include screenshot of initial synchro input, including lane configuration and geometry. Two vicinity maps (one with overall view, and one with view showing site). |
| 3            | **Adjacent Access Points; Site Access Location & Configuration**  
Map showing adjacent access points within 1000 feet of proposed access. Proposed site access(es) and discussion of location, including whether access will be full or partial. Inventory of existing road characteristics, land uses, trip generators, traffic controls, commercial access driveways, turn lanes. |
| 4            | **Existing Traffic Volumes**  
Gather existing traffic volumes. Provide a diagram of existing volumes in immediate vicinity, and intersections that may be impacted by project. Identification and inventory of time-of-day traffic volumes, vehicle types, turn movements, and pedestrian crossings. Analysis of existing traffic operation plans and levels of service including discussion of pre-existing conditions. |
| 5            | **Future Traffic Volumes / Total Traffic Volumes**  
Gather 20-year factor from CDOT and other sources of information. Show future volumes of background traffic in five years and 20 years. |
| 6            | **Trip Generation**  
Estimation of site-generated traffic. |
| 7            | **Pass-by Trip Generation**  
Estimation of site-generated and future traffic, including pass-by and diverted-linked trip modifications. |
| 8            | **Trip Distribution**  
Estimation of directional distribution and assignment (include estimation assumptions and ranges). Include diagram showing distribution in the vicinity of the proposed site. |
| 9            | **Site Circulation & Parking**  
Parking requirements and diagram showing proposed site circulation. |
| 10           | **Auxiliary Lanes**  
Impact assessment and mitigation measures needed (such as acceleration or deceleration lanes). |
| 11           | **Sight Distance Evaluation**  
Evaluation of sight distance according to CDOT regulations. Include photos of existing sight distances. |
| Final Paper  | **Conclusion**  
Analysis of built-out and future traffic operation plans, road geometrics, levels of service, and parking requirements. Should discuss alternative mitigation measures and possible developer requirements, overall recommendations to maintain existing levels of service and safety, or not to exceed acceptable levels. |
Presentations
Presentations may be assigned during the course. The student should plan on a presentation that meets given length requirements. It should be prepared in PowerPoint (or other similar program). Students will be graded on presentation skills, slide preparation, spelling/grammar and overall content.

Homework/Assignments
Homework assignments are due promptly at the beginning of class. I will not accept late homework assignments. No homework scores will be dropped. Homework should be computer generated, and include your name/date. Homework will only be submitted through Canvas as a .pdf.

The Syllabus shows the tentative homework problems and due dates. Be sure to check Canvas, as problems and due dates may change throughout the semester.

Extra Credit
You may earn up to 50 points per semester towards your homework score (each homework is 100 points) for attending engineering-type extra-curricular activities. This could include attending Senior Design trade fair or an American Society of Civil Engineers meeting. Each event is 10 points.

In-Class Participation
A portion of your grade includes in-class participation. You will be graded on attentiveness, promptness, courtesy to fellow students and the instructor, respect, attendance, and your participation in class discussion. A student that remains on his/her laptop during the entire class will receive a low participation grade. During the semester, if you would like to know your up-to-date grade for this portion of the course, please let me know.

Attendance Policy
Class attendance is mandatory: Every student is expected to attend each lecture. You must notify the instructor via e-mail and ahead of time (when possible) if you will be absent from class. Missing three or more class sessions may result, at the instructor’s discretion, in a final grade of “F” for the course. In general, only the following will be considered by the instructor as excused absences:

- Medical emergencies.
- Mandatory participation of the student in a school-sponsored event as described in the undergraduate catalog. (Note: In this situation, the student must follow all the guidelines and procedures specified in the undergraduate catalog).

Note: The instructor will consider all other circumstances on a case-by-case basis.

If for some reason a student misses a class session, it is the student’s responsibility to find out which material was covered and which assignments were given.
**Academic Honesty**
Please keep in mind I have a zero tolerance policy for cheating and/or plagiarizing. According to the school guidelines, “Plagiarism is the use of another person’s words or ideas without crediting that person. Plagiarism and cheating will not be tolerated and may lead to failure on an assignment, in the class, and dismissal from the University.” I will work under the assumption that anything you hand in to me is indeed your own work, and any breach of this trust will not be tolerated.

Generally, all pictures or charts presented in a report or presentation that are not original to the author should include a citation; do not paraphrase or copy any document word-for-word without citing the source and putting the appropriate text in quotations; and please cite your sources for any data and/or information you collect in research.

Although cooperative learning among yourselves can be helpful, you are expected to perform and present your own work. Copying someone else’s assignment or cheating on exams will not be tolerated and will be handled according to University policies if found to occur. You are responsible for observing the University’s Student Code of Conduct regarding these matters.

**URL for Academic Honor Code and Discipline Policies:**


**Miscellaneous Items**

**Course Communication**
Email is normally the best way to get in touch with me. However, I will gladly meet with any student face-to-face or spend time on the phone with them if they need additional assistance. You may meet with me during office hours (posted on first page). I will also meet with students after class or by appointment, so please do not hesitate to contact me if you would like to meet.

One requirement for this course is that you maintain an email address, check it regularly for messages, be sure it is working, and let me know if you change your email address. You are responsible for any messages - including assignments and schedule changes - that I send you via email or Canvas.

**Access, Disability, Communication**
The University of Colorado Denver and Health Sciences Center is committed to providing reasonable accommodation and access to programs and services to persons with disabilities. Students with disabilities who want academic accommodations must register with Disability Resources and Services (DRS), 177 Arts Building, 303-556-3450, TTY 303-556-4766, FAX 303-556-2074. I will be happy to provide approved accommodations upon providing me with a copy of DRS’s letter.

**Cell Phone Communication**
Please do not use cell phones during class. My aim is to create a climate for learning characterized by respect for each other and the contributions each person makes to class.