

# PPD 633: Methods and Modeling Tools for Transportation Planning

Course ID: 51272  
Units: 4  
Spring, 2021  
Tuesday 6-9:20pm  
Location: Zoom

Instructor: Hsi-Hwa Hu, Ph.D.

Office Hours: After class or by appointment

**Contact Info:**  
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## COURSE DESCRIPTION AND OBJECTIVES

This is an introductory class for graduate students with special focus on transportation planning, travel demand analysis, planning methods and strategies, online tool application, and transportation data analysis. This class covers four major areas:

### 1. Regional Transportation Plan and Strategies

A regional transportation plan works as a blueprint to guide a region to solve transportation issues. Through planning procedure, the plan is to develop strategies, methods, and policies to resolve identified issues in the future. This class will cover those planning strategies that were developed and adopted in the regional transportation plan for SCAG region in Southern California, which hopes to give students a comprehensive framework about planning methods that solve transportation issues.

### 2. Socioeconomic Data and Travel

Socioeconomic data and variables are basis for transportation analysis. Clear definition of primary socioeconomic variables will be introduced. As main explanatory variables to travel behavior analysis, this class will discuss how travel behavior or travel patterns are related to different socioeconomic characteristics. This class will also cover main data source for California, including California DOF and EDD.

### 3. Travel Demand Model

A 4-step trip-based model (TBM) is introduced and taught in the class. With a 4-step model structure (trip generation, trip distribution, modal split, and network assignment), students can learn many useful concepts and techniques of transportation model and travel demand analysis. Goods movement by trucks is another important component to transportation plan. This class will cover a heavy-duty truck model that estimates truck trips

### 4. Tools and Data

A regional travel demand model is too large and too complicated for project-level analysis. Many public data and online tools are available for transportation analyses at local levels. This class will bring students several useful tools and data available online, including IPUMS USA (ACS data), CTPP, LEHD OnTheMap, EPA MXD model, CARB emission rate by modes, and Caltrans' PeMS,

HPMS, and traffic count. This class will also introduce 2017 National Household Travel Survey (NHTS) and its online analysis tool.

### **GRADING BREAKDOWN**

<b>Assessment Tool (assignments)</b>	<b>Points</b>	<b>% of Grade</b>
5 Homework Assignments @ 80 points	400	40
Class Participation	100	10
Midterm Exam	250	25
Final Project	250	25
<b>TOTAL</b>	<b>1000</b>	<b>100</b>

### **GRADING SCALE**

Course final grades will be determined using the following scale

A	950-1000
A-	900-949
B+	870-899
B	830-869
B-	800-829
C+	770-799
C	730-769
C-	700-729
D+	670-699
D	630-669
D-	600-629
F	590 and below

## COURSE OUTLINE AND SCHEDULE OF TOPICS

2021	Topics/Class Activities	Reference / Suggested Readings	Assignments
<b>Week 1</b> 1/19	<b>Introduction</b> 1. Course Overview / Introduction 2. Transportation Plan Framework: SCAG (Southern California Association of Governments) Long-Range Regional Transportation Plan	Slides provided in class  SCAG Connect SoCal <a href="https://www.connectsocial.org/Pages/default.aspx">https://www.connectsocial.org/Pages/default.aspx</a>	
<b>Week 2</b> 1/26	<b>Emissions &amp; VMT</b> 1. Air pollutants & GHG emissions 2. VMT (Vehicle Miles of Traveled) 3. Emission Rate (ARB EMFAC 2017 Web Database) 4. SB 743 & CEQA	Slides provided in class  ARB EMFAC 2017 Web Database <a href="https://arb.ca.gov/emfac/2017/">https://arb.ca.gov/emfac/2017/</a>  SB743: check California OPR <a href="http://opr.ca.gov/ceqa/updates/sb-743/">http://opr.ca.gov/ceqa/updates/sb-743/</a>	
<b>Week 3</b> 2/2	<b>Travel Cost &amp; Pricing Strategies</b> 1. Auto Operating Cost 2. VMT Elasticity 3. Pricing Strategies * In-class Exercise	Slides provided in class	
<b>Week 4</b> 2/9	<b>Transportation &amp; Land Use Strategies</b> 1. ZEV (Zero Emission Vehicle) / EV (Electric Vehicle) 2. TDM (Travel Demand Management) / TSM (Transportation System Management) 3. Shared Mobility (Micromobility, Car Share, TNCs) 4. Capacity Improvement & Induced Demand 5. Land Use Strategy 6. New Modes / Future Technology (CAVs, MaaS, Online Activities)	Slides provided in class  Southern California Plug-in Electric Vehicle Atlas <a href="https://scag.ca.gov/southern-california-pev-readiness-atlas">https://scag.ca.gov/southern-california-pev-readiness-atlas</a>  Induced Demand Calculator <a href="https://blinktag.com/induced-travel-calculator">https://blinktag.com/induced-travel-calculator</a>  How connected vehicles would work in real word <a href="https://www.its.dot.gov/cv_basics/cv_basics_realWorld01.htm">https://www.its.dot.gov/cv_basics/cv_basics_realWorld01.htm</a>	Homework
<b>Week 5</b> 2/16	<b>Socioeconomic Data (SED) &amp; Growth Forecast</b> 1. Variable Definition 2. SED and Travel Demand: Population (age, workers); Households (household size, income); employment (by industry – NAICS)	Slides provided in class  California DOF Data <a href="http://www.dof.ca.gov/Forecasting/Demographics/">http://www.dof.ca.gov/Forecasting/Demographics/</a>	
<b>Week 6</b> 2/23	3. SED Data Sources 4. ACS – IPUMS USA Online Tool (please register before the class) 5. Growth projection (TBD) * In-class Exercise	California EDD Data <a href="https://data.edd.ca.gov/">https://data.edd.ca.gov/</a>  IPUMS USA <a href="https://usa.ipums.org/usa/">https://usa.ipums.org/usa/</a>	Homework
<b>Week 7</b> 3/2	<b>Introduction of transportation Model</b> 1. Model Types: TBM, ABM 2. Model Input: SED and Network 3. Model Output & Operation	Slides provided in class  PeMS <a href="http://pems.dot.ca.gov/">http://pems.dot.ca.gov/</a>	

	<p>4. Model Development Procedure</p> <p><b>Transportation Data and Analysis</b></p> <p>1. Online Transportation Data:  - PeMS (please register before class), -  - Caltrans count book,  - HPMS</p> <p>2. Private Vendors: GPS / Location Based, Streetlight, Replica  * In-class Exercise</p>	<p>HPMS  <a href="https://dot.ca.gov/programs/research-innovation-system-information/highway-performance-monitoring-system">https://dot.ca.gov/programs/research-innovation-system-information/highway-performance-monitoring-system</a></p> <p>Caltrans Traffic Data  <a href="https://dot.ca.gov/programs/traffic-operations/census">https://dot.ca.gov/programs/traffic-operations/census</a></p>	Homework
<b>Week 8</b> 3/9	<p><b>Mid-Term</b></p> <p><b>Topic: TBD (pre-recorded)</b></p>	Slides provided in class	<b>Mid-term Exam</b>
<b>Week 9</b> 3/16	<p><b>Trip Based Mode 1: Trip Generation</b></p> <p>1. Household Vehicle Availability  2. Trip Generation: Production and Attraction  3. Regional Model Demo  4. EPA MXD Model:  Off-model approach to calculate Trip Generation  * In-class Exercise</p>	<p>Slides provided in class</p> <p>SCAG Trip Based Model Validation Report  <a href="http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf">http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf</a></p> <p>EPA MXD Model  <a href="https://www.epa.gov/smartgrowth/mixed-use-trip-generation-model">https://www.epa.gov/smartgrowth/mixed-use-trip-generation-model</a></p>	Homework
<b>Week 10</b> 3/23	<b>No Class</b>		
<b>Week 11</b> 3/30	<p><b>Trip Based Mode 2: Trip Distribution &amp; Modal Split</b></p> <p>1. Trip Distribution: model concept, factors affect destination choice  2. Growth Factor methods: in-class exercise  3. Modal Split: model concept &amp; factors affect mode choice  4. OD matrix (PA to OD)</p>	<p>Slides provided in class</p> <p>SCAG Trip Based Model Validation Report  <a href="http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf">http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf</a></p>	
<b>Week 12</b> 4/6	<p><b>Trip Based Mode 3: Assignment</b></p> <p>1. Traffic Assignment procedure  2. Route selection: Shortest Path  3. Link volume: All or Nothing, User Equilibrium  4. Volume Delay function  * In-class Exercise</p>	<p>Slides provided in class</p> <p>SCAG Trip Based Model Validation Report  <a href="http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf">http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf</a></p>	Homework
<b>Week 13</b> 4/13	<p><b>Data and Project Analysis Tools</b></p> <p>1. Longitudinal Employer-Household Dynamics (LEHD) OnTheMap Tool  2. Census Transportation Planning Program (CTPP) Web Tool  * In-class Exercise</p>	<p>Slides provided in class</p> <p>LEHD OnTheMap Tool  <a href="https://onthemap.ces.census.gov/">https://onthemap.ces.census.gov/</a></p> <p>Census Transportation Planning Product Program (CTPP)</p>	

		<a href="https://ctpp.transportation.org/">https://ctpp.transportation.org/</a>	
<b>Week 14</b> 4/20	<b>Travel Analysis with 2017 National Household Travel Survey (NHTS) Online Tool</b> 1. Introduction of 2017 NHTS: Get familiar with file structure and variable definition 2. NHTS Explorer Tool 3. Travel Behavior analysis with NHTS Explorer Tool * In-class Exercise	Slides provided in class  2017 NHTS Online Analysis Tool and Documentation <a href="https://nhts.ornl.gov/">https://nhts.ornl.gov/</a>	Homework
<b>Week 15</b> 4/27	<b>Heavy-Duty Truck Model</b> 1. Truck Types and Emission Rate 2. Model Structure 3. Port 4. Data Source 5. Last-mile delivery	Slides provided in class  SCAG Trip Based Model Validation Report <a href="http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf">http://www.princeton.edu/~alaink/Orf467F16/SCAG_RTDM_2012ModelValidation.pdf</a>	
<b>FINAL</b>			

## Statement on Academic Conduct and Support Systems

### Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](https://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, [policy.usc.edu/scientific-misconduct](https://policy.usc.edu/scientific-misconduct).

### Support Systems:

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*  
[studenthealth.usc.edu/counseling](https://studenthealth.usc.edu/counseling)

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

*National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call*  
[suicidepreventionlifeline.org](https://suicidepreventionlifeline.org)

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

*Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call*  
[studenthealth.usc.edu/sexual-assault](https://studenthealth.usc.edu/sexual-assault)

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

*Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298*  
[equity.usc.edu](https://equity.usc.edu), [titleix.usc.edu](https://titleix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298*  
[usc-advocate.symplicity.com/care\\_report](https://usc-advocate.symplicity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

*The Office of Disability Services and Programs - (213) 740-0776*  
[dsp.usc.edu](https://dsp.usc.edu)

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

*USC Campus Support and Intervention - (213) 821-4710*

[campussupport.usc.edu](http://campussupport.usc.edu)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

*Diversity at USC - (213) 740-2101*

[diversity.usc.edu](http://diversity.usc.edu)

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

*USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu), [emergency.usc.edu](http://emergency.usc.edu)

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

*USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu)

Non-emergency assistance or information.