Orf 467:
Transportation Systems Planning and Analysis

Fall 2017/2018

Course Description
Enrolled Students


Week 0
Wed Sep 13
Introduction and Survey of Course
Elements of the transportation sector of the economy, the player, the technologies, the information sources
Reading: Smart Driving Car, Street Smart by Samuel Schwartz Has Growth in Automobile Use Ended?
2017 Motor Vehicle Crashes: 1st Half
FATALITY ANALYSIS REPORTING SYSTEM (FARS) ENCYCLOPEDIA National Transportation Statistics:
Basic background on Transportation in the US (Pocket Guide 2017)
Travel Monitoring
Highway Statistics Publication Archive
Freight Facts & Figures 2015
Commodity Flow Survey
National Transportation Statistics 2017
WTI Crude
Homework 1: The Last Drop or StreetSmarts or The coming of autonomous Taxis; Due Monday, Sep 18
Class Notes: Week 0, Current News

Week 1
Mon Sep 18
Evolution of Urban transportation Technology: From the Omnibus to PRT (Personal Rapid Transit, “Transport System of the Future???”) History of PRT; Historical evolution of National Transportation Policy leading to current National Transportation Policy.
Readings: Travel in London; PRT@LHR; Jerry Schneider’s Source Page, PRT@LHR10Conf; Podcar_Stockholm_2011;
2GetThere/Masdar; Animations: IndiaPRT; Bath; NJ PRT Academic Look,
Class Notes: History Slides, Current News
http://orfe.princeton.edu/~alaink/PRT/Movies/DelhiIndiaPRT_Animation.mp4
Mon Sep 18 Precept
Discussion of “Last Drop” and Big Picture view of Transportation in the next 20 years (be prepared to discuss this link!) Readings: Motor Fuel data and the Highway Trust Fund; State Gasoline Taxes
autonomous Taxis, Evolution of Crashless Cars

Readings: KPMG Report on Crashless Cars; Chunka Mui’s Series in Forbes; Todd Litman; state-wide autonomous Taxi; Transportation in 2038???; Smart Driving Car videos; Automation Workshop, 1st Princeton SmartDrivingCar Summit May 2016; PAVE_DARPA_Story

Class Notes: The Case for SmartDrivingCars;

Part 2. Planning and Analysis Tools of Transportation Demand and Investment

Week 2

Mon Sep 26
Class Discussion on the Future of Transportation Technology, given Transitions that have happened over the past 150 year. Come prepared having looked at HW 2 & Class Notes

Homework 2: How will the Mobility Environment Change by 2038? ; Due Tuesday, Sep 27

Class Notes: Slides: The Case for SmartDrivingCars, Adam Jonas Views of Future Mobility & Questions from HW2.

Precept Tue 27 7:30pm NOTE DAY Change from Monday
Discussion of MyCity homework objectives
Ref.: Class Notes MyCityTripGeneration

Background reference: NCHRP Synthesis 406 Advanced Practices in Travel Forecasting
Ed Weiner, Urban Transportation Planning in the US: An Historical Overview; 5th Edition; Analytical Travel Forecasting NCHRP765

Homework #2a,b My City Also See: My City Trip Generation
Examples: MyCityEx1, MyCityEx2, CityOfEden, CofEReport La Ville Report LaVille Data MyCitysummaryTableOrf467F16.xlx Due: Mon. Oct 2 & Mon 3 Before Precept.

Wed Sep 27
Urban Travel & Transportation System Characteristics: Planning Studies and Methods: Travel Demand Surveys, Data Sources, Intro to Sequential Demand Forecasting Modeling Approaches; Relating the Travel Demand with Land Use; Trip generation; Activity-based demand models
Ref.: Cascetta, Ch. 4.1- 4.5 New York Met Area Study, (see Notes for links) Travel Modeling Demand Modeling Notes

Background & Data Reference: LincolnTravelDemandModel SCAG Modelling TCRP B-15 Characteristics of Urban Travel, see especially: Overall Trip Rates; Travel Surveys: http://www.travelsurveymanual.org/
Class Notes Simple Demand Modeling, LincolnTripGen

Week 3

Mon Oct 2
Relating the Travel Demand with Land Use; Trip Distribution
Ref.: The Gravity Model, Example of Trip Distribution Mode Lincoln NEI SCAGTripDistribution
Class Notes: Notes Trip distribution Current News

Mon Oct 2 Precept
Presentation of MyCity Designs and Trip Generations
**Wed Oct 4**

Random Utility Theory and the modeling of **Mode Choice**

**Ref.:** Class Notes Cascetta, Ch. 3  
[Class Notes, ModeChoice, SCAG_ModeChoice LincolnModeChoice](#)

**Homework #4** [Final Report for MyCity, Current News](#)

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**Week 4**

**Mon Oct 9**

**Traffic Assignment** and paths through networks; Network Analysis: Shortest Paths: Label Setting and Label Correcting, Shortest paths in Real Networks and Essentially Shortest Paths; Dijkstra’s Algorithm

**Readings:**  
DykstraApplet; Another Dykstra Visualization  
http://www.princeton.edu/~alaink/Orf467F10/LincolnTrafficAssignment.pdf  
5.1-5.3, Magnanti, Ch2, Ch4 (to be distributed)

**Ref.:** Class Notes SCAG_Networks SCAG_TrafficAssignment LincolnTrafficAssignment  
http://www.scag.ca.gov/modeling/pdf/MVS03/MVS03_Chap04.pdf

**Assignment:** Magnanti: 2.1, 2.2, 2.3, 2.4, 2.5, 2.30, 2.31, 2.43, 2.44, 2.45, 4.1, 4.14, 4.15 (These are straight forward. Do them with your partners; turn in one solution set per two person pair. Both work on all problems).  
**Due Friday, Oct 21.**

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**Tue Oct 10 Precept**

**More on:** Paths through networks; Network Analysis: Shortest Paths: Label Setting and Label Correcting, Shortest paths in Real Networks and Essentially Shortest Paths

Label Setting; Dial and Radix Heap Implementations of Dijkstra’s; Label Correcting; real world networks and stochastic issues

**Readings:**  

**Ref.:** Class Notes Magnanti Ch 4, especially 4.5 through 4.9; Readings on Networks, Comparisons of Orf467F10 My Cities, FlowMapExamples; Tharald Fongaard’15 Traffic Flow Display System

Oral Presentations of Production, Attractions and Work Trip Distribution of MyCity

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**Wed Oct 11**

**Princeton Trip Synthesizer**

**Ref.:** NJ Trip Synthesizer; Tharald’s Trip Display System

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**Week 5**

**Mon Oct 16**

**More on:** Paths through networks;

Network Flow (Transportation Problem); Wardrop’s 1st & 2nd Principles, Assignemnet Techniques and kshortest paths

**Ref.:** Transportation Network Design ;Hunt, Kornhauser, “Assigning Traffic Over Essentially-Least-Cost Paths” The transportation Problem

Posponed Special Seminar: Adam Jonas, Managing Director, Morgan Stanley|Research, “The Business Case for Driverless Cars”

**Monday Oct 16 & Tuesday Oct 17 Precepts**

Oral Presentations of Final Report of MyCity & Discussion about networks
Wed Oct 18
Special Seminar: Marty St. George, Exec. VP of Commercial & Planning @ Jet Blue. “Planning for Cuba and Beyond”

Week 6
Mon Oct 23
Special Seminar: Joshua Herbach’08, Google Driver-less Car Team “Self-Driving Cars”

Tue Oct 24 Precept (No precept… Mid term week)

Wed Oct 25
Special Seminar: Samuel I. Schwartz, Author “Street Smarts: The Rise of Cities and the Fall of Cars”
Comparisons of MyCity 2016
Modeling of the ride-sharing potential of aTaxis in NJ and the Nation
Organization of Term Assignment: Nation-wide aTaxi System Design: Assignment v1, Teams
Reference: NJPRT04, NJPRT05, NJPRT07, NJPRT08, NJPRT09, NJPRTF10;
Synthesis of Daily Person Trips in NJ (Summary Slides)
Synthesizing Individual Travel Demand In NJ
MultiTripSynthesizer;
http://orfe.princeton.edu/~alaink/NJ_aTaxiOrf467F14/Orf467F14Disaggregated_Pixels_View.pptx;
http://orfe.princeton.edu/~alaink/Theses/SeniorTheses%2714/DraftWyrough_NoationalDisaggregateTripSynthesizer.pdf
 Brownell TRB 2014 Paper

Term Break Oct 29 – Nov 5

Part 3 The Role of High Technology in Transportation

Week 7
Mon Nov 6
More on Modeling of Individual Person-trips in NJ and the Nation
http://www.princeton.edu/~alaink/Orf467F16/Orf467F16IndividualTripSynthesizer.pptx
Disaggregated_Pixel_Views_in_NJ
Orf467National_aTaxiPixelGrid
Examples_of_some_{Lat,Lon}<-_PixelCoordinates
NationWide Trip Data
Visualization of USA Person Trips
Ref.: Earth Point: Excel To Kml – Display Excel Files in Google Earth
Driverless: Intelligent Cars and the Road Ahead by Hod Lipson and Melba Kurma, MIT Press, 312 pp
Assignment: Trip Distributions and Ride-sharing Opportunities in your county: Familiarize yourself and summarize the underlying PersonTrip Distribution in Your Counties: Due Precept, Nov 14/15, 2015

Tue Nov 7 7:30-9:00pm Precept (No Monday Precept!!)
Dr. Chenyi Chen
DeepDriving: Application of Deep Learning to Automated Driving
Fundamentals of Machine Learning and specific approaches to Computer Vision for Collision Avoidance and Self-Driving & Introduction to ChenyiChen Automated Driving Simulator

Class Notes: Fundamentals of Machine Learning & “Extracting Cognition out of Images”. Chenyi Chen ’16

**Wed Nov 8 Lecture**

Synthesis of Nationwide Individual PersonTrips: Discuss Final Term Projects

Ref.: List Final Projects Orf467F16 ; Final Project Teams and Task Assignment

Class Notes:

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**Week 8**

**Mon Nov 13**

Analyzing the ride-sharing potential of aTaxis in NJ and the Nation,

**Readings:** Interplay_Between_Fleet-size, LoS and EmptyRepositioning S. Zhu & A. Kornhauser

*A Ridesharing Analysis with a Hitchhiking Modification Applied to Taxi Trips in New York* A. Schindele’16

Quantifying the Potential for Dynamic Ride-Sharing of New York City’s Taxicabs S. Bhat’16

Analyzing 1.1 Billion NYC Taxi and Uber Trips, with a Vengeance T. Schneider

Nationwide Person Trip DataBase: http://orf467.princeton.edu/db

Class Notes: AVO_Analysis_of_aTaxi_Trips_Throughout_NJ

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**Mon/Tue Nov 13/14 Precept**

First impressions of Trips originating from you home county from Kyle’s NationWideTrips’16 Directory

**Wed Nov 15**

More on: Analyzing the ride-sharing potential of aTaxis in NJ and the Nation

Class Current News

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**Week 9**

**Mon Nov 20**


**Couple things for fun:**

http://orfe.princeton.edu/~alaink/Presentations/DinkyFutureFinalAlainAndrew.ppt

http://orfe.princeton.edu/~alaink/Presentations/OpenBelowGradeDinkyStationConcepts.pdf

http://orfe.princeton.edu/~alaink/Presentations/RadicalImprovements3wPRT.pptx

**Wed Nov 22**

NO CLASS (exam the previous evening);

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**Week 10**

**Mon Nov 27**

Empty aTaxi repositioning in your USA County

Class Notes: Management of Empty aTaxis
Assignment: HW-6 Investigate Empty vehicle Repositioning Implications of USA Mobility.
Readings: Shirley Zhu’s Thesis (Zhu'16MakingTransportationGreat_Thesis.pdf) and “Interplay_Between_Fleet-size,_LoS_and_EmptyRepositioning” S. Zhu & A. Kornhauser

Tue Nov 28 Precept
USA_aTaxi16 Empty Vehicle Management Work Session  Progress report of Final Projects:  Final Project Teams and Task Assignment

Wed Nov 29
Special Seminar: Adam Jonas, MD, Morgan Stanley “Disrupting World-wide Mobility” Slide Presentation

Week 11
Sunday Dec 3
7:30pm  Review for Exam
101Sherrerd

Mon Dec 4

**Exam**: Monday Dec 4  1:30- 2:50pm 101 Sherrerd
Exam covering weeks 1-9 Instructions

Tue Dec 5 Precept
NJ aTaxi Work Session :
**Assignment**: Final Project; 2nd Assignment: Empty aTaxi Management  Dec 13, 2015

Wed Dec 6
Individual presentations of  Interim Report  of NJ_aTaxi design
**Readings**: aTaxiFinalProject_Analysis_of_Demand for and Management of USA aTaxi System

Week 12
Mon Dec 11
NJ aTaxi work Session

Tue Dec 12 Precept
NJ aTaxi Work Session :
**Repeated Assignment**: HW-6 Investigate Empty vehicle Repositioning Implications of USA Mobility

Wed Dec 13
Individual presentations of  Interim Report  of NJ_aTaxi design
**Readings**: aTaxiFinalProject_Analysis_of_Demand for and Management of USA aTaxi System

**Reading Period** 10:00 am - 1:00pm Saturday Jan 13, Final Workshop on Term Project:  Lunch will be served.
**Schedule**