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
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.xlSX 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

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: DijkstraApplet; Another Dijkstra Visualization http://www.princeton.edu/~alaink/Orf467F17/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 Current News

Mon Oct 10 Precept
Oral Presentations of Progress on MyCity: Work Trip Distribution + …
Comparisons of Orf467F10 My Cities

Wed Oct 11
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
Network Flow (Transportation Problem); Wardrop’s 1st & 2nd Principles, Assignment Techniques and k-shortest paths
Additional Readings: He, Kornhauser & Ran, “Essentially best routes in dynamic and stochastic networks”.
Ref.: Class Notes Magnanti Ch 4, especially 4.5 through 4.9; Readings on Networks, FlowMapExamples; Tharald Fongaard’15 Traffic Flow Display System
The transportation Problem
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 20.

Week 5
Mon Oct 16
More on Networks and Princeton Trip Synthesizer
Ref.: NJ_Trip_Synthesizer; NationWideNetwork Links, Nodes, ReadMe; NationwideSynthesizedPersonTrips Current News

Monday Oct 16 Precepts
Oral Presentations of Final Report of MyCity & Discussion about networks

Wed Oct 18
More on .Princeton Trip Synthesizer: Nationwide Synthesizer
Ref.: NJ_Trip_Synthesizer; Tharald’s Trip Display System
Week 6
Mon Oct 23
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)
SynthesizingIndividualTravelDemandInNJ
Mufti: TripSynthesizer:
http://orf.princeton.edu/~alaink/NJ_aTaxiOrf467F14/Orf467F14Disaggregated_Pixels_View.pptx;
http://orf.princeton.edu/~alaink/Theses/SeniorTheses%2714/DraftWyrough_NoationalDisaggregateTripSynthesizer.pdf
; Brownell_TRB_2014Paper

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

@ 7:30pm Special Seminar: Joshua Herbach’08, Google Driver-less Car Team “Self-Driving Cars”

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

Mon Nov 6 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
Using_GTAV_to_Learn_Distances_TRB_Final A. Filipowicz & A. Kornhauser
Week 8

Mon Nov 13
Analyzing the ride-sharing potential of aTaxis in NJ and the Nation.
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

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

Week 9

Mon Nov 20
In-vehicle Satellite Navigation: From TravTek to Navigation Based Services; Global Positioning Systems (GPS)
511 Traffic http://www.trafficland.com/; Bay Area, South Florida; Virginia TampaBay; Minnesota Traffic.com; Real-time ATIS http://www.photoenforced.com/us.html; Class Notes Current News

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);

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

Exam: Wednesday Nov 29 1:30- 2:50pm 101 Sherrerd
Exam covering weeks 1-10 Instructions

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

Mon Dec 4
Special Seminar: Ben Baldanza, Former CEO Spirit Airlines, , Exec. VP of Commercial & Planning @ Jet Blue. “Planning for Cuba and Beyond”

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: aTaxisFinalProject_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
Special Seminar: Marty St. George, Exec. VP of Commercial & Planning @ Jet Blue. “Planning for Cuba and Beyond”

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