**Civil & Environmental Engineering Joseph L. Schofer**

**Northwestern University Fall 2019**

**CEE 371: Introduction to Transportation Planning and Analysis**

**CEE 479: Transportation Systems Planning and Man­agement**

**Syllabus**

**Overview**

In these jointly-taught courses we will study the characteristics of transportation systems, their functions, organization, operations, and planning. We will explore both passenger and freight transportation, urban and intercity facilities and services. We will discuss some history, contemporary issues, and the future, with emphasis on sustainability and rapidly emerging technologies and service concepts. We will learn some useful tools for analysis, problem solving and service design, including systems analysis and problem solving, elements of travel forecasting, network analysis, and demand modeling, transportation data analysis and sources, and methods to design scheduled transportation services

We will combine lectures and discussions, individual homework, some guest lectures, and a series of small-team assignments, group explorations into specific, contemporary topics.

The lecture-discussion components of these two courses (371 & 479) are taught jointly to encourage interaction among students with a wide range of experiences and perspectives, permitting peer teaching and learning. Civ\_Env 479 students will meet for separate discussion sessions on selected Fridays, scheduled in advance. Assignments and exams will be different for graduate and undergraduate students, and each will be graded separately. We will not use a text book. Readings will be posted on Canvas.

**Expectations for Students**

* Please come to class prepared to participate based on announced topics and occasional readings. The transportation world is all around us, it is full of action, and, at least for this quarter, I am counting on you to read, observe, and track interesting issues and bring them into class discussions. [What to read? Major national newspapers – *Wall Street Journal* (online and free for NU students) is best for transportation business news, also the *New York Times*, *the Hill* (online), and for ASCE members, *ASCE Smart Briefs*, a daily web-based “clipping service.” For regional issues, *the Chicago Tribune*. And, chances are that your home town newspaper or TV stations are online and might be worth following.
* Participation in class will contribute about 10% of your term grade. This will include engagement in general discussion and responses to questions about assigned readings which we will pitch to you throughout the quarter. We will assess both the quality and quantity of your contributions to class discussions – this gives you an incentive to read and think about assigned materials.

**If you don’t participate in class, we will all be bored, you’ll just read your text messages, and your grade will suffer. Don’t let this happen!**

* Attendance and attention are required. When I will be absent, I will tell you in advance. I expect the same from you. If you must be absent (e.g., athletes, musicians, job candidates, family visits, illness), please let me know in advance if you can.
* Do bring laptops or smartphones to class, but do not use them to play games, send e-mail, texts, or tweets. Instead, use them to search for immediately useful information for class discussions and in-class problem solving.
* Recapitulation – what did we learn? At the end of each class we will select one student – a different person each day – to remind us of what we talked about and what we learned.
* There will be about 6 homework/lab assignments, one group problem solving exercise.
* Grading:
	+ Class participation, 10%; for 479 students, this will include and emphasize active contributions to the Friday discussion sessions
	+ Six homework assignments, 50%;
	+ 20% mid-term exam - one hour
	+ 20% final exam – two hours in class on Monday, December 9, from 9:00 until 11:00. The final will mainly cover material presented after the midterm… but it may include major topics students missed in the midterm!
* Please stay in touch through the Canvas site, in the classroom, and e-mail.

**Written Assignments and Submission Guidelines**

Homework assignments must be written in mature English – that will count in your grade – and be submitted as editable documents, e.g., MS Word, Excel or PowerPoint (type) documents, so we can write comments into them - no PDFs will be accepted. Text should be double spaced in 12 point font, with one inch margins all around. Page limits will be specified, and you must observe them, as we will in grading your work. Cite all of your sources, and don’t submit work copied from other people.

Assignments will be posted on Canvas and they must be uploaded to the assignment link on Canvas. Do not use cover sheets, but be sure to put your name on every page of all documents submitted for grading. Please name files you submit using your own name, like “Williams assignment 3.docx.”

**Schedule**

Class meets Mondays and Wednesdays from 2:00 until 3:50, in Annenberg G21; graduate students will meet on most Fridays in same time slot, location to be determined. The final exam will be on Monday, December 9, at 9:00 a.m.

Topics and activities are posted in the daily calendar below. I am usually available to meet students after class and at other times by appointment - use e-mail to schedule, or just follow me after class. If you want to meet me, just ask.

**Teaching Team**

Instructor: Prof. Joseph L. Schofer Tech L-274 – second floor, administrative corridor. j-schofer@northwestern.edu

I am interested in transportation policy analysis and planning, finance, infrastructure resilience, and learning from natural experiments. I host a podcast on infrastructure on which I interview experts on the subject: [www.theinfrastructureshow.com](http://www.theinfrastructureshow.com).

Teaching Assistant: Maher Said, a third year PhD student in transportation engineering. He knows a lot about analysis tools, simulation software, coding, etc. MaherSaid@u.northwestern.edu.

Guest Lecturer: Dr. Jeffrey Newman, Cambridge Systematics, Chicago

Schedule of Topics (tentative)

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| **Date** | **Topic** |
| W 25 Sept | Transportation, what it is, what it does: system model, accessibility through mobility, structure of US transportation system; multi-scale nature of transportation; need for decision support, planning, & forecasting |
| M 30 Sept | Transportation problems, opportunities: equitable mobility; environment and externalities; climate change and disruptions; new technology; sustainability what does it mean for transportation? Homework #1 – travel and equity – using the ACS |
| W 2 Oct | Evidence-based planning and decision making, and where to get the evidence. Planning, forecasting, demand-supply equilibrium, introduction to the 4-step forecasting process. Input-output structure of the component models. |
| F 4 Oct | Civ\_Env 479 discussion: the role and failures of forecasting |
| M 7 Oct | A look inside the components of the 4-step demand forecasting process: trip generation, trip distribution – the gravity model as an analog. How people find their way through networks. Digital representation of networks.  |
| W 9 Oct | Finding efficient paths in networks- minimum cost path algorithm and practical limitations. Traffic assignment models – modeling interaction users on network (Maher Said) Homework #2 – network analysis |
| F 11 Oct  | Civ\_Env 479 discussion: no meeting this day |
| M 14 Oct | Modeling discrete travel choices – mode choice: importance, data sources (surveys, RP, SP data), model structure, example applications (TBD) |
| W 16 Oct  | Mode choice model estimation, basic statistics, interpretation, and application (TBD) Homework #3 – choice modeling |
| F 18 Oct | Civ\_Env 479 discussion: no meeting this day |
| M 21 Oct | Mode choice review, application – in class model interpretation; discussion: forecasting for new technologies – High Speed Rail, self-driving cars, Urban Air Mobility (TBD).  |
| W 23 Oct | Integrating view of planning and the role of forecasting. Goals and decision criteria for private and public sector transportation. |
| F 25 Oct | Civ\_Env 479 discussion: the 4 step process – critique and options |
| M 28 Oct | Transportation & sustainability at multiple scales: what does it mean to you, to us, to society? Readings to be discussed |
| W 30 Oct | Non-motorized travel – if that’s the answer, what’s the question? |
| F 1 Nov | Civ\_Env 479 discussion: sustainability – what can we really do? |
| M 4 Nov  | Public transit – definitions, utilization patterns, if we build it, will they come? Homework # 4 – using the National Transit Data base |
| W 6 Nov | TNCs: the good, bad and ugly. Mobility as a service: the future? |
| F 8 Nov | Civ\_Env 479 discussion: BRT and easier transit options |
| M 11 Nov | **Midterm exam – one hour** |
| W 13 Nov | Transit oriented development, land use planning, reducing the need to travel, scheduled service design. Homework #5 –designing a ferry service |
| F 15 Nov | Civ\_Env 479 discussion: TOD – examples from the private sector? |
| M 18 Nov | Freight, urban logistics, impacts and options |
| W 20 Nov | Team problem solving: Freight New York discussion and analysis  |
| F 22 Nov | Civ\_Env 479 discussion: observing and measuring local deliveries |
| M 25 Nov | Connected and automated vehicles – will they change the transportation world  |
| W 27 Nov | **NO CLASS TODAY THANKSGIVING TOMORROW** |
| F 29 Nov | **NO CLASS TODAY THANKSGIVING HOLIDAY** |
| M 2 Dec | Ownership and finance of transportation systems and services  |
| W 4 Dec | Evaluation and decision making: who does it, how, and the role of sustainability |
| F 6 Dec | Civ\_Env 479 discussion: what did we learn here? |
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August 20, 2019