

## NORTHWESTERN UNIVERSITY MASTERS OF SCIENCE PROGRAM IN TRANSPORTATION SYSTEMS ANALYSIS AND PLANNING (2024-2025)

The MS in TRN requires 12 course units in addition to a writing requirement and the Seminar in Transportation Engineering

Track	1 <sup>st</sup> Quarter/Fall	2 <sup>nd</sup> Quarter/Winter	3 <sup>rd</sup> Quarter/Spring	
<b>4 Courses/Quarter plus Transportation Engineering Seminar</b> The five courses listed on the right columns are required courses	<b>Introduction to Transportation Planning and Analysis (371)</b>	<b>Infrastructure Systems Analysis (483)</b>		
		<b>Travel Demand Analysis &amp; Forecasting 1<sup>1</sup> (480-1)</b> <b>Transportation Systems Analysis I (471-1)</b>		
	<b>Seminar in Transportation Engineering (517) – no tuition zero credit seminar</b>			
<b>Tracks Recommendation</b>	Transportation Systems and Operations Research	<b>Introduction to Transportation Engineering (376, *)</b> <b>Foundations of Optimization (IEMS 313, \$, &amp;)</b> Mathematical Optimization (IEMS 450-1)	<b>Mathematical Optimization (450-2)</b> <b>Transportation Systems Operations II: Urban Network (472-2, +, #)</b>	<b>Transportation Systems Analysis II (471-2, *)</b> <b>Transportation Systems Operations I: Scheduled Modes and Real Time Systems (472-1, +, #)</b>
	Data Science	<b>Applied Mathematical Statistics (IEMS 401,\$, !)</b> <b>Introduction to Applied Econometrics (ECON 281-0, !)</b> Stochastic models and simulation (IEMS 315) Uncertainty analysis (306) Statistical Methods for Data Analysis (IEMS 304)	Statistical Learning (IEMS 402)	<b>Data Analytics for Urban Systems (474, \$)</b>
	Transportation Economics and policy	Microeconomics (Econ 310) <b>Transportation Economics and Public Policy (ECON 355, \$)</b> Introduction to Econometrics (ECON 480, !)		<b>Advances in Travel Demand Analysis and Forecast (480-II, +, #)</b>
	Advanced Mobility Technologies	Supply-Chain Modeling and Analysis (IEMS 381)		<b>Data Analytics for Urban Systems (474, \$)</b>
Writing requirement	<b>A zero-unit independent study course (508) Please see Appendix B for detailed requirement.</b>			
<b>Please see Appendix A for explanations.</b>				
<sup>1</sup> Pre-requisites: any course from ECON 281, CIV ENV 306, IEMS 304, IEMS 315, IEMS 401, ECON 480-1, or equivalent.				

### Appendix A: Important notes on MS Program Table

1. Recommended courses/projects are in **bold** face in the table.
2. Recommended courses without any marks are *required*; Recommended courses marked with “\$” are electives.
3. For the two recommended courses marked with “\*”, at least one *must* be taken to fulfill the MS degree requirement.
4. For the two recommended courses marked with “+”, at least one *must* be taken to fulfill the MS degree requirement.
5. Recommended courses marked with “#” are offered in alternating years.
6. The students are recommended to take one of the two courses marked with “&”. While both courses cover optimization, IEMS 313 is more suitable for those who do not have a strong background in this area.
7. The course marked with “!” is a prerequisite for the required course CIV\_ENV 480-1. Of these courses, ECON 281-0 would NOT count towards the degree requirement because it is a 200-level course. However, it is *highly recommended* for both MS and PhD students who need a solid introductory course to applied econometrics. ECON 480-1 is suitable for students with strong background in statistics.
8. CivEnv 517: Seminar in Transportation engineering. All students are expected to register and attend the seminar series through the year.
9. Seminar in Responsible Conduct for Research. Researchers and MS/PhD students are required to attend. MS students with PhD aspirations are encouraged to attend.
10. Electives are not limited to the courses listed in the table. Other 300 level courses or above may be taken as electives, subject to the faculty supervisor’s approval. Students may also take up to 3 research/independent-study units, which also requires the faculty supervisor’s approval.

## Appendix B Transportation System Program Writing Requirement for the M.S. Degree

In addition to satisfactory completion of required coursework, M.S. students must conduct an independent research effort and prepare a research report. This could focus on a subject covered in the coursework of our program, or it may go beyond into an area of special interest to the student. The work and the product must have these characteristics:

- The work may be basic or applied research, an innovative analysis and solution to a practical problem, evaluation or development of a transportation policy, etc.
- It must be an original effort which, though limited in scope, demonstrates an interesting contribution to transportation and significant growth in the student's knowledge.
- By "original" we mean that the work must feature a contribution from the student him/herself, rather than being merely a survey of what others have done.
- The topic must be mutually agreed upon by student and his/her faculty advisor, which is to say that the advisor has a role in selection of topic from the outset.
- Students should consult with their advisors in the design of the effort, selection of tools and data, and interpretation of results.
- Any transportation faculty member may serve as principal advisor. Another Northwestern faculty member, or (if the substance of the topic so warrants) even an outside senior professional in the field, may serve as principal advisor with the consent of student, the candidate advisor, and the Transportation Program area coordinator, Prof. Nie.
- The effort should reflect approximately one month or 180 hours of full-time work. Of course the effort itself may be spread over a much longer time period.
- The final product must be a well-written report which is:
  - Suitable for use as a professional report or a paper for submission to a journal.
  - In clear and correct English
  - Structured with a title page, executive summary, table of contents, lists of figures and tables, main text including a review of the literature and/or work of others, structured with thoughtful headings, graphics integrated in the text, and references presented in proper and consistent format.
- Draft reports should be presented for review by the principal advisor and second faculty member prior to completion. Advisors must be given *a minimum of two weeks* for report review. Students must address all significant comments from the advisor.
- When the report is found to be satisfactory, advisor and secondary reader will clear the student for graduation.

**Appendix C: Sample Course Plan (Instructor or schedule may vary)**

<b>Fall Quarter</b>		
<b>Course</b>	<b>Instructor</b>	<b>Time Schedule</b>
CIVENV 376, Intro. to Transportation Engineering	Nie	MW 8-9:50
CIVENV 479, Transp. Systems Planning and Management	Schofer	MW 2-3:50 F (Lab) 2-3:50
ECON 281-0, Introduction to Applied Econometrics	Lewis	MWF 12- 12:50 PM
IEMS 313, Deterministic Models & Optimization	Wilson	MWF 11-11:50, M 4-4:50
CIVENV 517-1, SEMINAR IN TRANSPORTATION ENGINEERING	STATHOPOULOS	TH 3:30-5
Two additional courses from:		
IEMS 450-1, Mathematical Programming	Nohadani	MW 12:30-1:50
IEMS 401, Intermediate Statistics	Apley	MW 11-12:20
Econ 355, Transportation Economics and Public Policy	Savage	MWF 11-12:20
CIVENV 303, Environmental Law and Policy	Harley	Th 3:30-6:20
CIVENV 368: Sustainability: Issues & actions, near & far	Gray	T: 3:30-6:20
CIVENV 306, Uncertainty Analysis	Chen	MWF 12-12:50, T 9-9:50
Econ 331, Economics of Risk and Uncertainty	Siniscalchi	TTh 2-3:20
Econ 480-1, Introduction to Econometrics	Manski	TTh 1:00-2:50, F 9-10:50
Other electives: In EECS, Statistics, IEMS, Applied Math, Math, Economics. For example, Econ 309, 310, 326, IEMS 415, 464.		

<b>Winter Quarter</b>		
<b>Course</b>	<b>Instructor</b>	<b>Time Schedule</b>
CIVENV 471-1, Transportation Systems Analysis-1	Nie	TBA
CIVENV 472-1, Transportation Operations and Control: Scheduled Modes and Real Time Systems or Advanced Theories of Traffic Flow	Mahmassani	TBA
CIVENV 480-1, Travel Demand Modeling I	Stathopoulos	TBA
CIVENV 483, Infrastructure Systems Analysis	Durango-Cohen	TBA
CIVENV 517-2, Seminar in Transportation Engineering	Stathopoulos	Th 3:30-5
Elective: The City (Sociology 301), Development of the Modern American City 1870-Present (History 322-2), Introduction to Stochastic Simulation (IEMS 435), others in EECS/Stats/IEMS/Applied Math/Economics		

**Spring Quarter**

<b>Course</b>	<b>Instructor</b>	<b>Time Schedule</b>
CIVENV 471-2, Transportation Systems Analysis-2	Nie	TBA
CIVENV 472-2 Transportation System Operations: Urban Networks or Advances in Travel Demand Analysis and Forecast	Mahmassani	TBA
CIVENV 473-0, Survey methods, data and analysis	Stathopoulos	TBA
CIV_ENV 495-0-32: Data Analytics for Transportation and Urban Infrastructure Applications	Chen	TBA
CIVENV 517-3, Seminar in Transportation Engineering	Stathopoulos	Th 3:30-5
<b>Electives:</b> EECS/Stats/IEMS/Applied Math/Economics or others depending on advisor's approval		