JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING
NJIT New Jersey Institute of Technology

# TRAN 615 – 851-853 Traffic Studies and Capacity Analysis - Fall 2025

## Course Description:

The objective of this course is gain and understanding of highway capacity concepts and traffic studies used to evaluate the performance of transportation facilities. To be able to analyze the operation performance of interrupted flow facilities including: basic freeway sections, weaving areas, ramps and ramp junctions, multi-lane and two lane roadways

## Canvas:

The canvas course can be found at: https://canvas.njit.edu/. Please sign in using your UCID and password. If you are unable to log in or experience a problem please contact the NJIT Helpdesk - (973) 596-2900.

## Instructor:

**Prof. Janice Daniel**
Office: Colton Hall Room 273
Virtual Office Hours: Mondays and Wednesdays, 11:00 am – 12 pm (or by appointment).
https://njit.edu.zoom.us/j/97070250764?pwd=7QC3lPTjrZRxsuKQE50gQbB0d4vvgj.1
In-Office Hours: Wednesdays, 12 – 1 pm
Email: daniel@njit.edu

## Required Text:

Roger P. Roess, Elena S. Prassas and William R. McShane, Traffic Engineering, Prentice-Hall Inc, 5th Edition 2019.

*The lecture notes are not intended to replace the text for the course. The text book has Highway Capacity Manual information based on an older version of the Manual. The Reference text is the most up-to-date version of the Manual.*

## Reference Text – Highway Capacity Manual (HCM):

National Academies of Sciences, Engineering, and Medicine. 2022. Highway Capacity Manual 7th Edition: A Guide for Multimodal Mobility Analysis. Washington, DC: The National Academies Press. https://doi.org/10.17226/26432.

https://urldefense.com/v3/__http:/ebookcentral.proquest.com/lib/njit/detail.action?docID=6884499__;!!DLa72PTfQgg!IQRT1IsP1tq-gEB8cR3GkNV2IF5giTRRAcZX4bT6NHTcAUbFmizEoOclbHBSrIsG4K8NoWWcPL9TmOTGKIm5xrqCVQ$.

## Weekly Topics:

| Week of | Topic | Reading |
|---|---|---|
| 9/2 | Introduction – Traffic Flow Fundamentals | Chapters 1 and 5, |
| 9/9 | Introduction to Traffic Capacity Analysis | Chapter 7 and 28 |
| 9/16 | Multilane Highway Capacity Analysis | Chapter 28 |
| 9/23 | Weaving Area Capacity Analysis | Chapter 29 |
| 9/30 | Ramps and Ramp Terminal Capacity Analysis | Chapter 30 |
| **10/7** | **Test # 1 – Covering Chs. 1, 5, 7, 28** | |
| 10/14 | Two-Lane Rural Highways Capacity Analysis | Handout |
| 10/21 | Freeway Systems Capacity Analysis | Handout |
| 10/28 | Traffic Studies – Statistical Analysis | Handout |
| 11/4 | Volume Studies and Characteristics | Chapters 9 and 10 |
| **11/11** | **Test # 2 – Covering Chs. 29 and 30** | |
| 11/18 | Speed, Travel Time, and Delay Studies | Chapter 11 |
| 11/25 | Highway Traffic Safety Studies - Part 1<br>Thanksgiving Recess: 11/27 - 11/30 | Chapter 12 |
| 12/2 | Highway Traffic Safety Studies – Part 2 | Chapter 12 |
| 12/9 | **Final Test - Covering Two-Lane Hwys, Freeway Systems, Statistical Analysis, Traffic Studies and Highway Safety** | |

## Grading Policy:

**HW 20%**
**Discussion Question .. 5%**
**Tests(2) 50%**
**Final Test ……. 25%**

## Grading Scale:

**A: 100-90**
**B+: 89-85**
**B: .84-80**
**C+: 79-75**
**C: 74-70**
**F: Below 60**

## NJIT Honor Code:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

https://www.njit.edu/dos/sites/njit.edu.dos/files/NJIT%20University%20Policy%20on%20Academic%20Integrity_0.pdf

Please note it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

## Assignment Policy:

Homework will NOT be thoroughly graded, but you will still need to turn in your homework. Credit will be provided based on your final answers given. No credit will be provided once solutions have been posted. For homework assignments you should submit two items: (1) electronic copy of the completed homework (Word, pdf, excel); and (2) An excel spreadsheet I will provide to you with every homework assignment where you will input your final answers for your homework. You will not be able to include all of your answers in the excel spreadsheet.

You should identify how you will submit assignments electronically. You can submit all types of attachments (pdf, doc, xls). For some assignments which includes calculations, it may be easier to scan your written work into a pdf and submit that document, rather than type out the equations. Please avoid submitting attachments that are photos of your assignment as it is typically difficult for me to read these types of attachments. If you choose to submit excel spreadsheets, please note that I will not be able to look at your formula or how the calculation was determined. Therefore, you should show all the steps to get to your final calculation.

You can scan documents using your smart phone by following the steps:
For iphones: https://support.apple.com/en-us/HT210336
For androids: https://support.google.com/drive/answer/3145835?co

## Discussion Questions:

Discussion questions will be posted asking you to provide your thoughts on the question as it relates to a weekly topic. You should provide a brief, yet thoughtful, response. You should also provide a brief thoughtful response to two other student's posts stating the basis for your agreement, disagreement or asking a follow-up question with a justification for your question.

## Important Dates:

Test #1 Wednesday, October 7, 2025 (7:00 pm – 8:30 pm)
Test #2 Wednesday, November 11, 2022 (7:00 pm – 8:30 pm)
Final Test Wednesday, December 8, 2021 (7:00 pm – 8:30 pm)
Please make all efforts to be available to take the exam during these dates and times.

## Exam Policy:

Tests 1 and 2 are 90 minutes, administered through Canvas. Tests consists of various types of questions including some fill-in questions, some multiple choice questions, some calculation questions. The questions and some input variables will be randomly determined so each test will have some differences. To save time, you should provide your final answer during the test time and must submit any calculations used to reach the final answer after the completion of the test.

## Exam Proctoring Requirement:

Exam Proctoring Requirement NJIT policy requires that all midterm and final exams must be proctored, regardless of delivery mode, in order to increase academic integrity. The details for proctoring the test will be provided in advance of the test.

## Syllabus Information:

The dates and topics of the syllabus are subject to change; however, students will be informed of these changes.

## Email Policy:

Emails will generally be responded to within 24-business hours Monday - Friday.

## Items Required for this Course:

1. Webcam for taking exams.

**Outcomes Course Matrix – TRAN 615 – 851 - 853**

| Strategies and Actions | Course Student Learning Outcomes | ABET Student Outcomes (1-7) | Program Educational Objectives | Assessment Methods/Metrics |
|---|---|---|---|---|
| Course Objective 1: Understand the basic concepts and principles in traffic stream models and capacity analysis; | | | | |
| Explore a set of quantitative models for traffic flow characteristics | Demonstrate a good understanding of highway capacity concepts and traffic studies | 2, 7 | 1, 2 | Discussions and homework. |
| Have an overview of the basics of techniques for transportation system analysis | | 2, 7 | 1 | Homework. |

| | | | | |
|---|---|---|---|---|
| Use the results of capacity analysis to make planning decisions of the roadway network. | | 2 | 1, 2 | Homework. |
| Course Objective 2: To be able to analyze the operation performance of interrupted flow facilities | | | | |
| Apply the methodologies of the Highway Capacity Manual to determine the performance of roadway points and segments. | Demonstrate the ability to apply the methodologies in the HCM to assess the performance of new and innovative roadways, understanding the limitations of models.. | 2, 4 | 2, 3 | Discussion, homework |
| Encourage formulation and solution of realworld network problems using theoretical knowledge. | | 2, 4 | 2, 3 | Discussion, homework |
| Interpret the results of obtained from HCM methodologies to determine how the results can be used to improve roadway performance. . | | 2 | 2, 3 | Discussion, homework. |
| Course Objective 3: Learn and critically evaluate state-of-the-art techniques, models, and analytical tools in the field. | | | | |
| Assign curated literature reviews or technology overviews to familiarize students with cutting-edge approaches. | Learn and critically evaluate state-of-the-art techniques, models, and analytical tools in the field | 1, 2, 7 | 1, 2 | Discussion, homework and project. |
| Engage students in evaluating the strengths, limitations, and applicability of models or techniques through comparative studies or case-based analysis. | | 1, 2, 7 | 1, 2 | Discussion, homework and project. |

| | | | | |
|---|---|---|---|---|
| Include assignments that require students to critique research papers or real-world applications based on performance, assumptions, or scalability. | | 1, 2, 7 | 1, 2 | Homework, project. |
| Course Objective 4: Integrate the methodologies taught to address transportation problems through a project. | | | | |
| Apply the engineering principles taught to a real-world problem. Assess how changes can be made through engineering, policy and education. | Identify and solve real world problems through real world transportation problems. | 7 | 1, 2 | Homework, project. |
| Use existing crash data to perform statistical analysis and identify problem areas. . | | 2, 7 | 1, 2 | Homework project. |
| Examine a real-world safety problem and determine how the problem can be improved using traffic engineering principles. | | 2, 7 | 1, 2 | Homework, group project, exams. |

**CEE Mission, Program Educational Objectives and Student Outcomes**

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarships among our faculty and students
- to promote service to the engineering profession and society

**Program Educational Objectives**

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2. **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.

3. **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

**Student Outcomes**

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors

3. an ability to communicate effectively with a range of audiences

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated 8/2025