NJIT CIVIL AND ENVIRONMENTAL ENGINEERING

TRAN 610-101 TRANSPORTATION ECONOMICS

(3 credits)
Face-to-Face

Lecture Hours and Location:

Mondays, 6:00 PM – 8:50 PM
Colton Hall, Room 423 (COLT 423)

Instructor: Branislav Dimitrijevic, Ph.D.
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Office Hours: Tuesdays, 2:00 PM – 5:00 PM, or by appointment

Virtual Office Hours: by appointment via Zoom in the instructor's virtual Zoom meeting room (link).

Canvas: https://njit.instructure.com/courses/42919

Prerequisites:

Undergraduate course in economics.

Course Description:

This course will introduce the principles of engineering economics with specific applications to transportation systems. The topics covered in the course include: cost of highway and public transportation facilities and services; economic evaluation and comparison of project alternatives; transportation systems financing approaches, transportation tax concepts and government funding; programming highway and public transit improvements.

Course Objectives:

1. Understand the principles and practices of transportation systems economic analysis.
2. Learn practical application of methods for cost and benefit assessment in evaluation of alternative transportation improvement projects and transportation services.
3. Learn the principles of financing transportation systems and their continuous improvements.
4. Develop the capability to identify and solve transportation economics problems by applying adequate analysis methods, considering the availability of relevant information and appropriate assumptions.

Course Instruction Materials (in leu of required textbook):

Since no single textbook covers all the topics discussed in this course, there is no specific textbook requirement. Instead, the instruction will be based on the following references, some of which are available to students for online download and peruse:

- American Association of State Highway and Transportation Officials (AASHTO). User and Non-User Benefit Analysis for Highways (the "Red Book"). AASHTO, Washington, DC. September 2010. ISBN 978-1-56051-467-1.
- ECONorthwest and Parsons Brinckerhoff Quade & Douglas, Inc., TCRP Report 78: Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners, Transportation Research Board of the National Academies, Washington, D.C., 2002 [Online]. Available at: http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp78/guidebook/tcrp78.pdf.
- Kara M. Kockelman, T. Donna Chen, Katie A. Larsen and Brice G. Nichols. The Economics of Transportation Systems: A Reference for Practitioners. The University of Texas at Austin, 2014. ISBN 978-0615714790. Reference copy available at: https://www.caee.utexas.edu/prof/kockelman/TransportationEconomics_Website/TranspEconReference.pdf
- Class notes, slide presentations, and handouts – provided by the instructor in Canvas

POLICIES & PROCEDURES

Lectures/Class Attendance:

- The attendance will be taken at each lecture/class.
- Each student may be excused to miss up to two classes with prior permission/VALID reason. Each subsequent class absence will be reported to the Dean of Students and may affect student's standing and grade.
- Five (5) or more missed classes may result in an F grade.

Withdrawals:

To ensure consistency and fairness in application of the NJIT policy on withdrawals, student requests for withdrawals after the deadline will not be permitted unless extenuating circumstances (e.g., major family emergency or substantial medical difficulty) are documented. The course instructor and the Dean of Students are the principal points of contact for students considering withdrawals.

Handouts:

All handouts will be printed and distributed to students in class. They will also be posted in Canvas in electronic format.

Lecture Notes and Materials:

- The lecture notes will be posted in Canvas prior to each lecture. Other course materials may be posted in Canvas after the class (e.g., in-class exercises and homework solutions).
- Some lectures (equivalent to Modules in Canvas) will include recorded videos of homework solutions and in-class examples. The students are expected to review those videos to solidify the concepts and calculations presented in class, and as part of the preparation for exams.

Homework:

Homework assignments will be assigned to reinforce course learning objectives. The assignments will be targeted to provide practice for methods that may be included in course exams and the group project. The homework assignments will be posted in Canvas. Collaborating, sharing, and/or copying of exams or homework assignments is **NOT** allowed. Credit will not be given to individuals who either initiate, allow, or participate in such behaviors. The NJIT honor code will be upheld at all times and any violation will be brought to the immediate attention of the Dean of Students.

Homework Format:

Homework assignments will be provided electronically in Canvas as PDF documents. The submission of the homework assignments will also be through Canvas. Students must submit their homework assignments in a single PDF document, which can be a scanned copy of the hand-written assignment, or an electronic document converted to PDF format.

Late Homework:

The assignments must be turned in by the due date specified by the instructor. Late submissions will not be accepted.

Homework Solutions:

The homework solutions will be provided as recorded videos posted in Canvas. Students are expected to review all homework solution videos.

Exams:

Unless otherwise noted, the exams will be conducted in-person. There will be two exams throughout the semester. The exams will be conducted during the regular class hours, as indicated in the class schedule. The students will be provided the exam problems at the beginning of the examination period and will have a specified amount of time to complete the exam and submit the solutions to the instructor/proctor. Each student must submit the calculation sheets used to derive the solutions for the exam problems. The students may utilize the formula sheet during the exams, as approved by the instructor. If exams must be conducted

virtually (e.g., due to changes in the University pandemic policies, inclement weather, or other emergency), the instructor will provide timely and detailed information and instruction on the examination process.

Collaborating, sharing, and/or copying of exam/homework is **NOT** allowed. Credit will not be given to individuals who either initiate, allow, or participate in such behaviors. The NJIT honor code will be upheld at all times and any violation will be brought to the immediate attention of the Dean of Students.

Exam Makeup Policy:

There will be no makeup for exams, except in justifiable extenuating circumstances, as determined by the instructor.

Group Project/Case Study:

The class will be divided into multiple groups, each consisting of 2-3 students. Each group will be assigned a topic in a format of case study, or an outline of practical contemporary problem in economics of transportation system. The assignment will be given in the first month of the course. Each group will work on the assigned problem collectively and will present their findings and/or recommended solutions in class presentation. The projects must showcase an application of concepts discussed in class. Each group will prepare and submit the project report and is expected to present the outcome of the project at the last class meeting of the semester. The outline, format, and content of the report and presentation can be determined by each group to optimize their effectiveness, but they should contain at the minimum the following sections:

1. Introduction (problem statement and definition).
2. Background (including literature review).
3. Goal and objectives of the presented project.
4. Description of project methodology (including data collection).
5. Study (or analysis) results, solutions, findings.
6. Conclusions and Recommendations.

Academic Integrity:

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: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that 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.

Use of Artificial Intelligence (AI):

Student use of artificial intelligence (AI) is permitted in this course for certain assignments and activities. It is not permitted to be used in the following assignments, as doing so would undermine student learning and achievement of course learning outcomes:

- Assignments that require students to perform calculations and application of analytical methods;
- Group project, specifically the analysis of the problem and the proposed solution.

Additionally, if and when students use AI in this course, the AI must be cited as is shown within the NJIT Library AI citation page for AI. If you have any questions or concerns about AI technology use in this class, please reach out to your instructor prior to submitting any assignments.

Communication:

The preferred mode of communication between the students and the instructor outside of class is e-mail. Nevertheless, students can contact the instructor by phone with course-related questions, or schedule virtual consultations via Zoom. The instructor can be contacted through Canvas as well.

Hardware and Software Requirements:

- Each student is expected to have a personal computer to access (review, download) the course materials and submit homework assignments in Canvas.
- Engineering Scientific Calculator – will come handy for solving homework assignments and during the exams.
- Smartphone, tablet, or other devices can also be used to access the digital course materials and facilitate communication with the instructor and fellow students. However, the use of smartphones and similar devices during the exams will not be allowed. It is also not allowed to use the smartphones or tablet computers during the class other than in conjunction with the class lecture as appropriate.
- Microsoft Office Word, Excel, and PowerPoint (or similar software capable of reading and editing Word, Excel, and PowerPoint files, such as Google Docs, Sheets, and Slides, or Apple Pages, Numbers, and Keynote).
- PDF reader/scanner/maker software.

Instructor Commitment:

You can expect the instructor to be courteous, punctual, organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to

notify you beforehand if office hours are moved; to provide a suitable guest lecturer or pre-recorded lecture when they are traveling or unavailable; and to grade uniformly and consistently.

Students with Documented Disabilities:

NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Office of Accessibility Resources and Services located in Kupfrian Hall, Room 201, or by sending an email to OARS@NJIT.EDU. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: https://www.njit.edu/accessibility/

Calculation of Course Grade:

A weighted average grade will be calculated as follows:

Homework:	20%
Exam #1:	25%
Exam #2:	25%
Group Project:	30%

The grading scale requirements for final letter grades are as follows:

Grade	**Points**	**Significance**	**GPA**
A:	90 – 100	Excellent	4.0
B+:	85 – 89	Good	3.5
B:	75 – 84	Acceptable	3.0
C+:	70 – 74	Marginal Performance	2.5
C:	60 – 69	Minimum Performance	2.0
F:	Below 60	Failure	0.0

Other Class Polices:

Cell Phones and mobile devices (e.g., Laptop, iPad/Tablet PC, iPod, etc.): Cell phones shall be turned off or silenced prior to coming to class. Texting and the use of mobile devices during the class shall not be allowed.

Course Schedule:

Week	**Date**	**Topic/*Assignment***
1	09/09	- Introduction and Course Overview - Basic Concepts of Transportation Economics

Week	Date	Topic/*Assignment*
2	09/16	- Road User Costs and Benefits - Homework #1 Assigned
3	09/23	- Value of Time - Crash/Safety Cost and Benefit Evaluation - Homework #2 Assigned
4	09/30	- Rail Public Transportation Costs - Modeling of Operating Costs - Homework #3 Assigned
5	10/7	- Bus Public Transportation Costs - Capital and Maintenance Costs - Homework #4 Assigned
6	10/14	- Banking Formulae and Engineering Economics - Homework #5 Assigned
7	10/21	**Exam #1**
8	10/28	- Economic Evaluation of Alternatives - Homework #6 Assigned
9	11/04	- Local and Sub-regional Alternatives - Regional System Alternatives - Homework #7 Assigned
10	11/11	- Public Borrowing - Bonds - Homework #8 Assigned
11	11/18	- Transportation Tax Concepts and Government Funding - Reading (Case Study) Assignment
12	11/25	**Exam #2**
13	12/02	- Transportation Supply and Demand - Production Functions and Competition in Transportation
14	12/09	**Group Project/Case Study Presentations**

The dates and topics of the syllabus are subject to change; however, students will be consulted regarding any modifications or deviations from the syllabus throughout the course of the semester.

Outcomes Course Matrix – CE 610 Transportation Economics

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Understand the context and application of transportation economic analysis			
Discuss the types of problems addressed with transportation economic analysis.	1	2, 3	Homework assignments, class discussions, term project, exams.
Analyze the scale and context of problems addressed by transportation economic analysis.	1	2, 3	
Identify the required data and data sources for transportation economic analysis.	1,2	1, 2	Homework assignments, class discussions, term project.
Student Learning Outcome 2: Recognize the applicability of different aspects and methods of transportation economics analysis considering the type and scale of the problem, available data, and resources			
Ascertain different concepts and methods of transportation economic analysis and their application.	1	2	Homework assignments, class discussions, term project, exams.
Match up the analysis concepts, methods, and data to different problems in transportation economics.	1, 2	2	
Discuss the advantages and disadvantages of alternative methods for transportation economic analysis.	2, 3	2	Class discussions, term project.
Student Learning Outcome 3: Gain skills in applying different methods of transportation economic analysis			
Apply different types of models for the calculation of benefits, costs, and effectiveness of transportation projects.	2, 6	1, 2	Homework assignments, class discussions, term project, exams.
Apply the economic analysis methods to practical sample (case study) problems in transportation economics.	6	1, 2	Homework assignments, Class discussions, term project.
Solve a practical transportation economics problem by applying the concepts and methods learned in class.	3, 5, 6, 7	2, 3	Term project.

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 scholarship among our faculty and students,
- to promote service to the engineering profession and society.

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

1. Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward safe, practical, 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 a graduate study in engineering, research and development, professional registration, and continuing education; some graduates will transition into other professional fields such as 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.

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