TRAN 755 Intelligent Transportation Systems

(3 credits)

Lecture Hours and Location:

Wednesday, 6:00 PM – 8:50 PM
CULM 110

Instructor: Joyoung Lee, Ph.D.
Associate Professor
Department of Civil and Environmental Engineering
Office: 274 Tiernan Hall
E-mail: jo02@njit.edu
Office Phone: 973-596-2475

Office Hours: Wednesday, 3:00 PM – 5:00 PM, Friday 1:00 PM – 2:00 PM, or by appointment

Required Text:

- ITS-ePrimer (http://www.pcb.its.dot.gov/ePrimer.aspx).

Other Recommended Texts & Reading

- Sussman, Joseph. Perspectives on Intelligent Transportation Systems (ITS). New York, NY: Springer, 2010.
- Mashrur A. Chowdhury, and Adel Sadek, Fundamentals of Intelligent Transportation Systems Planning, Artech House, Inc., 2003.

Course Description:

This course will discuss the fundamental concepts and practices of Intelligent Transportation Systems (ITS). The primary topics of this course cover 1) National ITS Architecture; 2) Active Transportation and Demand Management (ATDM) and Active Traffic Management (ATM); 3) Connected and Automated Vehicles; and 4) Data Collection and Communications Technologies for ITS. Students will be assigned to a group project to hone their hands-on experiences of designing and evaluating real-world ITS applications. Every individual of this class will be asked to perform a term project.

Course Objectives:

1. Describe the fundamental concepts of Intelligent Transportation Systems
2. Implement working knowledge of emerging ITS applications
3. Identify the best practices of ITS
4. Recognize the gaps and challenges of current ITS applications
5. Develop capabilities to identify and solve transportation problems within the context of ITS applications

POLICIES & PROCEDURES

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.

Generative AI:

Student use of artificial intelligence (AI) is permitted in this course for some assignments and projects, subject to the instructor's permission. 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 WebEx. The instructor can be contacted through Canvas as well.

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 Professor 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. There will be approximately two-to-four homework assignments during the semester. The homework assignments will be posted in Canvas. 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.

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. It 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. No late homework will be accepted.

Term Paper (Subject to be changed)

Each student will conduct a term paper for a selected topic. The primary purpose of the term paper is to let students 1) scan previous research efforts related to the topic; 2) examine the gaps and challenges of the previous efforts; and 3) come up with new idea(s) to fill out the gaps and overcome the challenges. Choosing a topic for the term paper is up to student. Each student will be presenting the progress of the term project on a weekly basis; the presentation schedule will be announced during lecture. The timeline of the term paper is as follows.

- 3rd Week: Submit the list of term paper topics
- 6th Week: Submit term paper abstract
- 7th Week: Submit the final abstract of term paper
- 8st Week: Presentation
- 10th Week: Final paper

Project 1

This project aims to hone each student's data analytics skill for traffic condition (e.g., speed, travel time, volume, delay) forecasting by using practical dataset obtained from various sources (e.g., loop detector, radar sensors, cctv cameras) The tentative timeline of the group project is as follows.

- 6th Week: Matlab Lab for Traffic Data Forecasting

- 10th Week : Project 1 Final Report

Project 2

The class will be divided into several groups (i.e., up to 2 members per group) to conduct a hypothetical ITS design project. Each group will propose the most effective ITS application to address the given problem, using scenarios that reflect real-world practices and demonstrating the effectiveness of their proposal both visually and numerically. The tentative timeline for the group project is as follows

- 11st Week : Submit Project 2 Scope of Work
- 15th Week : Final Presentation & Final Report (Concept of Operations Document)

Calculation of Course Grade:

A weighted average grade will be calculated as follows:

Homework:	10%
Term Paper:	25%
Project 1:	30%
Project 2:	35%

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

A:	90 – 100
B:	80 – 84
C:	70 – 74
F:	Below 60

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 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 and Excel (or similar software capable of reading and editing Word and Excel files).
- PDF reader/scanner/maker software.
- Matlab version 2024 or above and PTV VISSIM version 2024 or above will be made available in the CEE Computer Lab. The instructor will make the best effort to obtain temporary student licenses, which would be distributed to students and could be used to install and use the software on students' personal computers for the duration of the semester.

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 Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 596-3414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)

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.

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.

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the **NJIT Library AI Citation page**. If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

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Course Schedule:

Week	Class Agenda	Deliverable
1	- Course Overview - Introduction to ITS	
2	- National/Regional ITS Architecture - Data Collection Technologies	
3	- Data Collection Technologies - Performance Measures	Term Paper Topic
4	- Lab 1: Traffic Data Collection (Remote Traffic Microwave Sensor; Video Analytics) - Active Transportation and Demand Management (ATDM) Overview	
5	- Advanced Traveler Information System & Forecasting Techniques	
6	- Lab 2: Matlab for Traffic Data Forecasting - Macroscopic Traffic Flow Theory Basics	Term Paper Abstract
7	- Active Traffic Management (ATM) – Variable Speed Limit	
8	- Active Traffic Management (ATM) – Ramp Metering **- Term Paper Presentation**	(Final) Term Paper
9	Spring Recess: No Class	
10	- ITS Evaluation Techniques: Sketchup- Macro-, Meso-, Microsimulations - Lab 3: VISSIM	Project 1 Report
11	- Transit Signal Priority	Project 2 Scope of Work
12	- Adaptive Traffic Signal Control	
13	- Adaptive Traffic Signal Control - Connected and Automated Vehicles	
14	- Connected and Automated Vehicles	
15	- Group Project Final Presentation	Project 2 Final Report
TBD	Final Exam	