Public Transportation Systems

Fall 2024

Course number	CVL746	**No. of credits**	3
Meeting Time:	Slot D (TWF 9-10 A.M.)	**Instructor's name:**	Pramesh Kumar
Email:	pkk@iitd.ac.in	**Instructor's office:**	322, Block-IV
Location:	336, Block-II	**Office Hours:**	-

Course website: Access the course material from https://prameshk.github.io/CVL746.html. Submit homework assignments through Moodle.

Course prerequisites: Student should know basics of calculus and transportation planning (covered in CVL741). Further, computer programming is required to do homeworks.

Course description: This course is designed to teach transit planning concepts and introduce mathematical models for analyzing and designing transit systems.

Reference books

There is no required textbook for this course. The following are the references:

- Ceder, Avishai. *Public transit planning and operation: Modeling, practice and behavior.* CRC press, 2016.
- Vuchic, Vukan R. *Urban transit: operations, planning, and economics.* John Wiley & Sons, 2017. [Free PDF]
- Gkiotsalitis, Konstantinos. *Public transport optimization.* Springer, 2022.
- Daganzo, Carlos F., and Yanfeng Ouyang. *Public transportation systems: Principles of system design, operations planning and real-time control.* 2019.

Research articles and other resources will be shared later.

Student learning aims/outcomes:

- Understanding transit oriented development
- Performing quality of service and capacity analysis
- Understanding various ways of collecting passenger behavior data
- Modeling transit network
- Understanding transit assignment models
- Using optimization solvers to solve various transit planning problems
- Learning about the recent advances in transit service

Tentative topics to be covered (may not cover all the topics)

- Why transit?, history of transit, Transit Oriented Development (TOD)
- Transit data
- Quality of service and capacity analysis
- Transit O-D estimation and ridership prediction
- Transit networks (static versus dynamic)
- Transit route choice
- Frequency-based assignment
- Schedule-based assignment
- Transit network design
- Frequency setting
- Timetable development
- Transit reliability and transfer synchronization
- Vehicle scheduling
- Crew scheduling
- Fare pricing
- Transit accessibility and equity
- Transit electrification
- Flexible transit service design
- Shared mobility, multimodal service

Homework assignments: You are encouraged (but not required) to use LaTeXto typeset your assignments. Please refer to this website to learn LaTeX. Late submission of assignment will be allowed up to two days after the deadline. For each day, there will be a penalty of 25% deduction in points.

Grading and other class policy: The following is the breakdown for grading:

In-class exercises (20%)
Homework assignments (25%)
Minor exam (25%)
Major exam (30%)

The major (final) exam will be cumulative, i.e., it will cover all the material taught during the semester. Participation in all components of this course is required to pass the course. Other policies are as follows:

- **Letter grades**: For the description of the letter grades and their cut offs, please refer to this link.
- **Attendance**: If a student's attendance is less than75%, the student will be awarded one grade less than the actual grade that she has earned. For example, a student who has got an **A** grade but has attendance less than 75% will be awarded an **A(-)** grade.

- **Auditing the course**: If a student is auditing the course, then she has to get at least 30% of the total marks (aggregated) and more than or equal to 75% attendance for obtaining audit pass **NP** grade. Otherwise, the student will be awarded **NF** grade.
- **Re-grade requests**: Requests for re-grading questions on an assignment/exam will be considered if submitted in writing within one week from the time the work is returned in class. Note that the score may change in either direction as a result of a re-grade. The instructor reserves the right to limit the number and scope of re-grades requested by a student.
- **Make-up exams:** Make-up exams can be arranged as per the institute rules.
- **Academic integrity:** All activities in this course must be done independently unless taken permission from the instructor. While solving the problems, you may discuss it with your peers, but the final answer must be your own. Copying from another student or plagiarizing from other sources will be considered cheating. You may be awarded a Fail **F** grade for academic dishonesty. The case will also be forwarded to the student advisor and Dean of academics. For more information about the honor code, refer to Courses of study.
- **Resources for differently-abled students:** If you require assistance in this regard, please refer and contact Office of accessible education.