

# LOGISTICS AND FREIGHT TRANSPORT

Spring 2025

<b>Course number</b>	CVL461	<b>No. of credits</b>	3
<b>Meeting Time:</b>	Slot A (Mon-Thu 8-9 A.M.)	<b>Instructor's name:</b>	Pramesh Kumar
<b>Email:</b>	<a href="mailto:pkk@iitd.ac.in">pkk@iitd.ac.in</a>	<b>Instructor's office:</b>	322, Block-IV
<b>Location:</b>	LH520	<b>Office Hours:</b>	TBD

**Course website:** [Moodle](#)

**Course prerequisites:** Student should know basics of calculus and linear algebra.

**Course description:** This course is designed to introduce mathematical models for analyzing and designing supply chains. There will be a special focus on logistics and freight transportation part of supply chain management.

## Reference books

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

- Goetschalckx, Marc. *Supply chain engineering*. New York: Springer, 2011. [[Link](#)]
- Ghiani, Gianpaolo, Gilbert Laporte, and Roberto Musmanno. *Introduction to Logistics Systems Management: With Microsoft Excel and Python Examples*. John Wiley & Sons, 2022. [[Link](#)]
- Chopra, Sunil, Dharam Vir Kalra, and Gourav Dwivedi . *Supply chain management. Strategy, planning & operation*. Pearson, 2024. [[Link](#)]

Research articles and other resources will be shared later.

## Student learning aims/outcomes:

- Understanding supply chain and its components
- Modeling freight demand generation and forecasting
- Understanding of both deterministic and stochastic inventory control models
- Understanding revenue management and pricing design
- Solving various network flow models in the supply chain networks
- Understanding traveling salesman (TSP) and vehicle routing problems (VRP)
- Understanding facility location and other design models
- Using off-the-shelf solvers to solve various optimization problems
- Improve presentation skill
- Learning about the recent advances

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

- Introduction to logistics and supply chain management
- Probability review
- Demand modeling and forecasting
- Inventory management
- Revenue management and pricing
- Review basics of network theory
- Review of linear and integer programming
- Single flow routing through network
- Routing multiple flows through network
- Traveling salesman problem (TSP)
- Vehicle routing problem (VRP)
- Facility location problem
- Supply chain models
- Advanced topics

**Grading policy:** The following is the breakdown for grading:

**In-class exercises (30%)**

**In-class presentations (15%)**

**Minor exam (25%)**

**Major exam (30%)**

1. **In-class exercises (30%)** We will be solving several in-class exercises together during the class. The students are encouraged to collaborate with each other while solving these problems. Student will get full credit as long as they put effort into understanding and solving the problems. In-class exercises should be submitted in the class. They will not be accepted after the class.
2. **In-class presentations (15%)** Papers will be assigned to teams of two members. The papers are selected to supplement lectures and important ideas. The team members and the papers will be assigned randomly. Each team will have to present the paper in 10 minutes, followed by 5 minutes of Q&A. The team will be responsible for presenting the summary of the paper, a critical assessment, and a set of open-ended questions on the last slide. You are allowed to use other media, such as videos, images, or any other activity. Everyone in the class is expected to participate in the discussion following each presentation.
3. **Minor exam (25%)**
4. **Major exam (30%)** The major (final) exam will be cumulative, i.e., it will cover all the material taught during the semester.

*Note: Participation in all components of this course is required to pass the course.*

**Other class policy:** 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 than 75%, 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) to obtain an 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](#).

**Tentative Schedule**

<b>Monday</b>	<b>Thursday</b>
Jan 2: Introduction to the course	Jan 6: Introduction to the course
Jan 9: Probability review	<i>Jan 13: No class (On leave)</i>
<i>Jan 16: Tuesday timetable</i>	
Jan 20: Probability review	Jan 23: Demand modeling and forecasting
Jan 27: Demand modeling and forecasting	Jan 30: Demand modeling and forecasting
Feb 3: Inventory management	Feb 6: Inventory management
Feb 10: Inventory management	Feb 13: Inventory management/Pricing
Feb 17: Pricing and revenue management	Feb 20: Mid-term review
Feb 24: <i>Mid-sem exams</i>	Feb 27: <i>Mid-sem exams</i>
Mar 03: Graph theory fundamentals	Mar 06: Review of linear and integer programming
Mar 10: <i>Mid-sem break</i>	Mar 13: <i>Mid-sem break</i>
Mar 17: Review of linear and integer programming	Mar 20: Gurobi and networkx practice
Mar 24: Single flow routing through network	Mar 27: Routing multiple flows through network
Mar 31: <i>Id u'l Fitr*</i>	
Apr 3: Traveling salesman problem (TSP)	Apr 7: Traveling salesman problem (TSP)
Apr 10: <i>Mahavir Jayanti</i>	
Apr 12: <i>Thursday timetable</i> VRP	
Apr 14: Vehicle Routing Problem (VRP)	
Apr 17: Facility location problem	Apr 21: Designing supply chain
Apr 24: Designing supply chain	Apr 28: Review

*\*subject to change*