

Transportation Systems & Network Design

No of Sessions- 30 hours course || 4 Modules

Target Audience- Frontline Executives and Mid-Level Managers interested in or working in the transportation and logistics sector.

Introduction

Transportation cost is a key component of logistic cost and contributes around 40 % of the logistic cost. In India, it is around 6 percent of GDP. An efficient, integrated, and seamless transportation system is the need of the hour to achieve the ambitious growth rate. Network design is fundamental to effective transportation systems. This course will provide the necessary understanding and required knowledge to design a robust transportation system to address the challenges faced by the nation. It is also vital to consider the sustainability aspect of transportation systems. Flawless integration of various transportation modes is another important dimension. Data-driven decision-making using ML, AI, and deep learning will immensely help in efficient operations.

Objectives-

- To understand the key requirement of the transportation system.
- To provide the knowledge and expertise to design an integrated transportation network System.
- To implement efficient operations using real-time information and data analytics to reduce cost and delivery time.

Pedagogy/Teaching Method:

Lectures, Case Studies, Modeling & Simulations, and Discussions in the class

Session Plan:

Module No	Sessions	Topics	Case Study
Module 1 Introduction to Transportation	1-4	<ul style="list-style-type: none"> • Importance of transportation systems and network design in logistics and economy at large 	Crainic, T. G., Ricciardi, N., & Storchi, G. (2009). Models for

Systems & Network Design		<ul style="list-style-type: none"> • Understanding movement and freight transportation in India • What are the requirements and challenges of various modes of transportation? • Understanding network design 	<p>evaluating and planning city logistics systems. <i>Transportation Science</i>, 43(4), 432-454.</p> <p>Goel, S., Sharma, R., & Rathore, A. K. (2021). A review on barrier and challenges of electric vehicle in India and vehicle to grid optimisation. <i>Transportation engineering</i>, 4, 100057.</p>
Module 2: Intelligent Data-Driven Transportation System and Effective Network Design(15 hrs)	5-14	<ul style="list-style-type: none"> • Demand prediction through real-time data-driven model • Integrated capacity planning • Use of ML, AI, and deep learning in decision-making • Infrastructure planning for seamless movement and equitable access • Robust network design • Dynamic and responsive scheduling in real-time • Fare pricing, and revenue modelling • Infrastructure management • Planning and promoting best practices 	<p>Jia, S., Meng, Q., & Kuang, H. (2022). Equitable vessel traffic scheduling in a seaport. <i>Transportation Science</i>, 56(1), 162-181.</p> <p>Cheng, Z., Pang, M. S., & Pavlou, P. A. (2020). Mitigating traffic congestion: The role of intelligent transportation systems. <i>Information Systems Research</i>, 31(3), 653-674.</p> <p>Behbahani, H., Nazari, S., Kang, M. J., & Litman, T. (2019). A conceptual framework to formulate transportation network design problem considering social equity criteria. <i>Transportation research part A: policy and practice</i>, 125, 171-183.</p>
Module 3 Sustainable and Safe Transportation (3 hrs)	15-16	<ul style="list-style-type: none"> • Efficient use of energy • Green transportation • Best practices for environmental, social, and governance • Guideline formulation for Compliance 	<p>Lodi, A., Malaguti, E., Stier-Moses, N. E., & Bonino, T. (2016). Design and control of public-service contracts and an application to public transportation systems. <i>Management Science</i>, 62(4), 1165-1187.</p>
Module 4: Case Studies/Real-	17-20	<p>Different case studies related to modern, intelligent</p>	<p>Narasimha, P. T., Jena, P. R., & Majhi, R. (2021). Impact of</p>

life applications (6 Hours)		transportation system.	COVID-19 on the Indian seaport transportation and maritime supply chain. Transport Policy, 110, 191-203.
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Course Learning Outcomes:

- To demonstrate the criticality of the transportation system and network design in economic development.
- To apply data analytics tools and emerging technologies for estimating demand and develop effective models for optimal decision-making for transportation systems as well as network design.
- To implement seamless transportation schedules across different modes of transportation to reduce cost and delivery time.
- To understand and implement sustainable practices in transport operations

Reference Material:

- Bell, M. G., & Iida, Y. (1997). Transportation network analysis.
- Cantarella, G., Watling, D., De Luca, S., & Di Pace, R. (2019). Dynamics and Stochasticity in Transportation Systems: Tools for Transportation Network Modelling.