

Indian Institute of Management Udaipur

Course name	Logistics: Operations and Analytics (LGS)		
Program	GSCM (1 Year)	Core/Elective	Core
Credits	4	Cap (if elective)	N.A.
Academic Year	2023-24	Term	2
Course Coordinator	Rahul Pandey	Email	pandey.rahul@iimu.ac.in

Instructor 1	Rahul Pandey	Email	pandey.rahul@iimu.ac.in
Sessions	20	Section	1 section
Affiliation	IIM Udaipur	IGSA Solutions Pvt Ltd	
Office Hours	No restriction (Send a mail/message to set up a meeting)		

Course description

This course is designed to help students learn the planning of logistics and supply chain operations and associated analytics for decision making.

Course Objectives

The objective of the course is to learn the process, design and planning of logistics and supply chain operations. A focus of the course is on the applications of analytical methods and tools to aid decision making in logistics and supply chain. It will cover the decision problems in production, transportation, distribution, inventory and warehousing, especially those arising in logistical planning of multi-echelon systems.

Topics include logistical allocations of flows in supply chains, distribution network design, vehicle routing and fleet sizing, warehouse management, inventory models, multi-echelon inventory systems, demand planning and pricing, and integration/coordination problems in supply chain management.

Specific learning objectives for the participants in this course are as follows:

1. Structure selected decision problems of logistics and supply chain planning, understand inherent trade-offs and relevant frameworks for analysis.
2. Model the selected decision problems with appropriate analytical methods and appropriate software tools (such as MS Excel, R and Python) and analyze the same from managerial perspective.

Key Takeaways: At the end of this course, students should be able to

1. Frame a logistics and supply chain related decision problem, articulate inherent objectives, constraints and trade-offs, and plan and implement relevant analytical approaches to support decision making.

2. Plan for and gain clarity about pursuing a professional career at the intersection of logistics, supply chain, and analytics.

Programme Level Learning Goals

The course aims to help students achieve the following learning goals (those which are applicable):

Goal 1: Integration: Students should be able to integrate across business disciplines.

Goal 2: Critical Thinking: Students should be able to identify and analyze key issues and evaluate alternative solutions.

- Identify the relevance and importance of issues. Accurately identifies the core issue.
- Provide solutions by integrating ideas and using the available evidence.

Goal 3: Team Dynamics: Students should be able to work as part of a team.

- a. *Contributes outside of team meetings:* Provide solutions by integrating ideas and using the available evidence. Completes all assigned tasks by deadline; work accomplished is thorough and comprehensive.
- b. *Contributes to team meetings:* Helps the team by articulating the merits of alternative ideas or solutions. Offers thoughtful and constructive ideas and suggestions. Actively builds on ideas of team members. Articulates merits of alternative ideas and suggestions.
- c. *Facilitates the contributions of team members:* Engages team members to facilitate their interaction and constructively builds upon their contribution. Encourages others to participate and complete assigned tasks to a similar level of excellence.

Goal 4: Communication Skills (Oral): Students should be proficient in oral communication.

- a. *Clarity:* Argument effectively and efficiently conveyed; highly focused on the question; easily understood.
- b. *Organization of ideas:* Coherent, comprehensive, and well-structured organization of ideas.
- c. *Style:* Confident, enthusiastic about the topic and engages the audience in discussion.

Goal 5: Communication Skills (Written): Students should be proficient in development of analytical, synthetic, and writing skills.

- a. *Clarity:* Argument is effective, concise, and easily understood. Thorough analysis of the data with compelling conclusion.
- b. *Organization of ideas:* Coherent, well integrated, clear and structured organization of ideas.
- c. *Style:* Writing style is appropriate for the topic and target audience.

Goal 6: Domain Expertise:

Pre-requisites

N.A.

Required Text Book(s):

Supply Chain Management: A Logistics Perspective by John J. Coyle, C. John Langley, Jr., Robert A. Novack, Brian J. Gibson

Reference book: Business Logistics/Supply Chain Management, Ronald H Ballou. 2007.

In addition to the above textbook, several readings and cases have been included.

Recommended Text Book(s)

“Supply Chain Analytics” by T A S Vijayaraghavan. Wiley. Wiley India Pvt Ltd. 2021.

Pedagogy

Lectures, Discussions of logistics and supply chain decisions, frameworks, cases and exercise problems, Presentations on analysis of cases/exercise problems.

Course Pack Distribution to students

Course material will be issued from the Programme office. Additional course material may be shared during the course.

Technology enabled learning component for your course

Practice analysis with software tools such as MS Excel, R, Python

Class Preparation, Participation, Presentation, and Pedagogy

The course a variety of decisions related to the design, planning and management of supply chain and logistics systems.

Every major decision topic will be covered over one, two or three sessions. Broadly speaking, for every decision problem, we will begin with understanding its conceptual aspects, its real-world applications, and the process of structuring and modeling for analysis. That will also entail a student group making a short presentation on analyzing a case or exercise with a sample dataset (provided beforehand) and drawing managerial insights. We will cover modelling and analysis of selected decision problems using MS Excel, Python and/or R tools. There will be frequent short quizzes to test students’ basic conceptual and analytical understanding of the topics. There will also be an assignment and an exam to assess students’ understanding of the concepts and the ability to structure and analyze a problem through tools such as MS Excel, Python and/or R.

Towards the latter part of the course there will be a short demonstration of a real-world analytical tool for integrated supply chain planning & execution over half a session.

In addition, students will carry out a project in teams. The project will entail going through the process of structuring a decision problem of operations and/or supply chain, preparing representative data, modelling the problem using one or more of the software tools learnt in the course, and carrying out scenario analysis.

Session Plan

Session No.	Topic	Content	Reading Material*
1	Introduction to Logistics and Supply Chain Management	Course overview; Introduction to logistics & supply chain management; Analytical applications to decision making in logistics and supply chain; Logistics performance metrics	Articles: * <i>Indian logistics and warehousing industry</i> * <i>Key Performance Indicators (KPIs) in supply chain and logistics</i> * A shift in fundamentals: The changing direction in logistics and transportation mgmt. * Measures for evaluating supply chain performance in transport logistics
2-3	Demand Side Planning-1: Forecasting	Forecasting models for different demand patterns	Case: Forecasting edible oil sales at Telwale Articles: * <i>Time series forecasting</i> * Time series forecasting using Holt-Winters exponential smoothing * Methods for intermittent demand forecasting * Machine learning models for sales time series forecasting * Forecasting with regression analysis
4	Demand Side Planning-2: Revenue Management	Pricing and revenue management in logistics services	Case: XYZ Logistics' revenue management problem Articles: * <i>Note on quantity based revenue management: the single resource case</i> * Pricing and revenue management * Introduction to the theory and practice of yield management
5-7	Inventory Management	Two-level inventory problem in a supply chain; Item classification; Inventory models – CRS & PRS; Inventory replenishment in multi-echelon systems; Rationalization of orders for vehicle utilization and other factors	Case: Freako Day Foods Case: Managing Inventories at ALKO Inc. Articles: * <i>Analyzing inventory cost and service in supply chains</i> * <i>Multi-echelon inventory optimization</i> * Inventory optimization at P&G: achieving real benefits through user adoption of inventory tools * Inventory-driven costs Article Links: https://medium.com/@rahulpandey.igsa/the-inventory-decision-1-analytics-of-placing-inventory-as-part-of-network-design-81c4b74b7ad1

			https://medium.com/@rahulpandey.igsa/the-inventory-decision-4-two-step-replenishment-logic-analytical-followed-by-rationalization-c0995bcde040 https://medium.com/@rahulpandey.igsa/inventory-decision-6-which-model-is-best-for-you-continuous-review-or-periodic-review-ee461993a626
8-10	Network Design: Setting Up a Supply Chain, Logistics & Distribution Network	<p>Trade-offs in network design, expansion and consolidation; Link of network design with strategy and business model; Centralized vs. decentralized facilities; Intermodal transportation network planning; Network design models: Analytical models for investments in facilities' locations and capacities;</p>	<p>Case: Goodbaby Group: The Upfront Warehouse Decision Case: EKOL Logistics: Thinking Outside the Box Case: FMC Biscuits redesigns supply chain network / MINI-FMCB – A mini network design problem</p> <p>Articles: * Aggregate control of inventories * Supply chain network design * Planning for disruptions in supply chain networks</p> <p>Article links: https://medium.com/@rahulpandey.igsa/the-inventory-decision-2-how-the-business-model-bears-on-network-design-and-inventory-placement-a32cf7582e3f https://medium.com/@rahulpandey.igsa/the-inventory-decision-3-design-network-and-inventory-placement-strategy-to-fit-with-b85a1a7f7f54</p>
11-12	Warehouse management and technology	<p>Warehouse management practices; Automation in warehouses; Warehouse management as part of supply chain management</p>	<p>Case: Ultron: Managing Warehouse Space and Product Obsolescence Case: Warehousing Strategy at Volkswagen Group Canada</p>
13-15	Supply Side Planning-1: Logistical allocations and transport mode-mix planning in production-distribution chain	<p>Logistical allocations, transport mode-mix planning and stock building in multi-tiered supply chain; Quarterly/monthly and daily logistics planning as part of S&OP; Evaluating multi-mode routes; Models and analysis; Compliance analysis; Bottleneck analysis</p>	<p>Case: FMC Biscuits Plans Production & Logistics Allocations for its Supply Chain Case: Integrated Sales & Operations Planning Problem</p> <p>Articles: * Effective S&OP decision-making can't be achieved without insights from analytics * Integrated production and distribution operations: taxonomy, models, and review * Sales and operations planning optimisation: contribution and limits of linear programming</p> <p>Article links:</p>

			https://medium.com/@rahulpandey.igsa/align-analytical-tools-with-efficient-decision-processes-part-1-5704832a9a85 https://medium.com/@rahulpandey.igsa/opining-on-optimization-3-a-supply-chain-planning-problem-9341c9588456 https://medium.com/@rahulpandey.igsa/opining-on-optimization-4-a-supply-chain-execution-problem-c0a68b721a8b
16-17	Supply Side Planning-2: Route planning and fleet sizing for transportation and distribution	Route planning and fleet sizing problems in distribution and collection stages; Last mile and first mile problems; Vehicle route planning models; Fleet sizing & mix models	Case: RLS Logistics: Combating Vendor On-time Performance for “Cool” Customers Case: BadiTokri.com A Distributor’s Route Planning Problem Articles: * <i>Vehicle routing and scheduling</i> * The life and times of the savings method for vehicle routing problems (VRPs)
18	Industry expert presentation		
19-20	Project presentations	Teams present their project work (decision tool based on analytical models for logistics/supply chain analysis)	

The following eleven cases will be presented in class, one by each group:

Session-2: Forecasting edible oil sales at Telwale

Session-4: XYZ Logistics’ revenue management problem

Session-5: Freako Day Foods

Session-7: Managing Inventories at ALKO Inc.

Session-8: Goodbaby Group: The Upfront Warehouse Decision

Session-9: EKOL Logistics: Thinking Outside the Box

Session-11: Ultron: Managing Warehouse Space and Product Obsolescence

Session-12: Warehousing Strategy at Volkswagen Group Canada

Session-13: FMC Biscuits Plans Production & Logistics Allocations for its Supply Chain

Session-16: RLS Logistics: Combating Vendor On-time Performance for “Cool” Customers

Session-17: BadiTokri.com

Note: For the cases that require data analysis, show your calculations/model/results using MS Excel or Python or R software

Evaluation Components

Components	Weightage
Class presentation and participation	20%
Assignment	20%
Quizzes and Exam	40%
Project	20%

Online Course Management (Moodle)/course web

Additional course materials, power point slides and assignments are shared in the course web by respective instructors after the corresponding classes, as and when required.

Mapping for the course with Program Level Goals

Goal 1	Goal2	Goal 3	Goal 4	Goal 5	Goal 6
Ability to integrate across business disciplines	Critical Thinking	Team Dynamics (a,b,c)	Communication Skills (Oral) (a,b,c)	Communication Skills (Written) (a,b,c)	Ethical Responsibility (a,b)
Sessions 1, 14, 17	Sessions 1-20	All group presentations (Session 3, 5, 6, 7, 10, 11, 13, 16, 17, 19-20)	All group presentations (Session 3, 5, 6, 7, 10, 11, 13, 16, 17, 19-20)	All written submissions (project report for session 19-20 and assignment)	Sessions 1-20