MDSL 823	Supply Chain Modeling, Design and Simulation	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	Students should have basic concepts of logistics & supply chain, analytical & logical skills and, business mathematics & statistics. They should be well acquainted with use of Excel Spread Sheet.				
Co-requisites	--				

Course Objectives

1. Familiarize them with modeling and simulation vocabulary and approaches
2. Supply Chain application of these approaches in strategic, tactical & operational decision making
3. Use of Spread Sheet and Open Source Packages, where applicable in seeking solutions

Course Outcomes

On completion of this course, the students will be able to

CO1. Students will understand what and why about mathematical modeling in business environment.
CO2. Students will learn to model various business situations (how) which will help them to take strategic, tactical and operational decisions in logistics & supply chain domain.
CO3. Students will learn to use Spread Sheet and Open Source Packages to model and seek solutions (how)

Catalog Description

Science and scientific methods are increasingly becoming important to analyze management issues and arrive at decisions over descriptive logical reasoning. This course provides the basis for it. This course deals with strategic, tactical and operations decision making situations and applies mathematical modeling techniques to seek the solution.

Course Content

Unit I: **6 lecture hours**
Mathematical Modeling Systems – Descriptive, Analytical, Deterministic, Stochastics (Probabilistic) and, Heuristic

Unit II: **6 lecture hours**
Spread Sheet based mathematical modelling

Unit III: **6 lecture hours**
Demand forecasting in supply chain

Unit IV: **6 lecture hours**
Business process and simulation

Unit V: **6 lecture hours**
Supply chain Integrated planning and optimization

Unit VI: **6 lecture hours**
Application of modeling systems to strategic decision making – facility addition, facility location, network design and choice of transportation modes

Unit VII: **6 lecture hours**

Application of modeling systems to policy decision making – Replenishment Policy, Stocking Policy, Shipment Policy

Unit VIII: 6 lecture hours

Application of modeling systems to operational decision making – Vehicle Routing and Scheduling

Text Books

1. Shapiro, James F. Modelling The Supply Chain, 2nd Edition. Thomson.

Reference Books

1. Vohra N. D. Quantitative Techniques in Management, 4th Edition. Tata McGraw Hill
2. Sharma J. K. Operations Research: Theory and Applications, 4th Edition. McMillan.
3. Winston Wayne L. Operations Research: Applications and Algorithms, 4th Edition. Cengage
4. Hillier S Frederick and Hillier S Mark. (2009). Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets, 3rd Edition. Tata McGraw Hill
5. Balakrishnan, Nagraj, et al. Managerial Decision Modeling with Spread Sheet, 2nd Edition. Pearson.

Modes of Evaluation:

Components of Continuous Evaluatiom: Individual Assignment (IA)/Group Assignment (GA)/Written Quiz (WQ)

Components	IA	GA	WQ	End Semester Examination
Weightage (%)	30	10	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	COURSE OUTCOMES (COs)	**POs**
CO 1	Students will understand what and why about mathematical modeling in business environment.	PO 1,2, 3,4,7,8,9,10, 11,13, 14
CO 2	Students will learn to model various business situations (how) which will help them to take strategic, tactical and operational decisions in logistics & supply chain domain.	PO 1,2, 3, 7,8,9,10, 11,14
CO 3	Students will learn to use Spread Sheet and Open Source Packages to model and seek solutions (how)	PO 1,2, 3, 8,9,10, 11, 13,14

Program Outcome / Course Outcome mapping

Course Outcomes	**CO 1**	**CO 2**	**CO 3**
PO 1	3	3	3
PO 2	3	3	3
PO 3	3	3	3
PO 4	3	1	1
PO 5	2	2	1
PO 6	1	1	1
PO 7	3	3	1
PO 8	3	3	3
PSO 9	3	3	3
PSO 10	3	3	3
PSO 11	3	3	3
PSO 12	1	1	1
PSO 13	3	1	3
PSO 14	3	3	3

		Students will be able to develop and evaluate alternate managerial decisions and identify optimal solutions	Students will demonstrate effective application capabilities of their conceptual understanding to the real world business situations	Students will be able to exhibit effective decision making skills, employing analytical and critical thinking ability	Students will demonstrate effective oral and written communication skills in the professional context	Students will able to work effectively in teams and demonstrate team building capabilities	Students will exhibit leadership and networking skills while handling business situations	Students will demonstrate sensitivity towards ethical and moral issues and have ability to address them in the course of business	Students will demonstrate employability traits in line with the changing dynamics of the industry	Students will demonstrate strong conceptual knowledge in the functional area of management as well as LSCM domain	Students will demonstrate effective understanding of relevant functional areas of management and their application in LSCM	Students will demonstrate analytical skills in identification and resolution of business problems pertaining to LSCM & general management	Students will exhibit the ability to integrate functional areas of management with domain perspective for the purpose of planning, implementation & control of LSCM	Students will have global perspective towards business situations in the area of LSCM	Students will exhibit deployable skills pertinent to the LSCM sector
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 9	PSO 10	PSO 11	PS12	PSO 13	PSO14
MDSL 823	Supply Chain Modeling, Design and Simulation	3	3	3	2	2	1	3	3	2	2	3	2	3	3

1 – Weakly mapped
2 – Moderately mapped
3 – Strongly mapped

Model Question Paper

Name: **Enrolment No:**	UPES

Course: MBSL 823 – Supply Chain Modeling & Design
Programme: MBA- Logistics & Supply Chain Management **Semester: 3**
Time: 03 hrs. **Max. Marks:100**

Instructions:
Attempt all questions from **Section A** (each carrying 1 marks); any **Two Questions** from **Section B** (each carrying 20 marks)**. Section C** is Compulsory (carrying 40 marks)**.**

Section A (attempt all questions)

1.	a.Mathematical Modeling is converting …….. and …….. about a situation into …… expressions	**[3]**	**CO3**
	b. The area bounded by constraints in a graph of a LP Model is called …….	**[1]**	**CO1**
	c.The characteristics of a LP situation are ……. and are …….. by more than one ……., having an objective to ……. also be a source of ……. on the	**[5]**	**CO2**
	d. ……., e.g. labour laws on working hours of manpower can also be a source of …… on LP	**[2]**	**CO4**
	e.In LP, one seeks to determine the …… for optimum value of objective function in a given situation	**[1]**	
	f. Linear Programming Problem is an example of …… , …… and …… business situation	**[3]**	
	g.The cyclic factor is as important as the trend and seasonality factors in forecasting for short and/or intermediate-term decisions in Logistics & Supply Management TRUE FALSE	**[1]**	
	h.Forecasts with exponential smoothing will always lag behind the demand TRUE FALSE	**[1]**	
	i.Base series can be last year's demand series, if the seasonal cycle is of one year's duration TRUE FALSE	**[1]**	
	j.Moving average removes the random errors and represents the forecast for the next period TRUE FALSE	**[1]**	
	k. Simple Exponential Smoothing does not take care of the trend in the demand at all TRUE FALSE	**[1]**	
	Words to be chosen from the table below Linear Limitation Feasible region shared External conditions numerical data Mathematical level of activity Static limited resources		

	Constant decision variables Deterministic Optimize verbal descriptions		
	SECTION B (Attempt any **Two Questions)**		
2.	Write Short Notes on any four (4) topics given below Marks : 04Q x 05M = 20M a. Feasible Region, Feasible Solution and Optimum Solution of a Linear Programing Problem b. Graphical Method, Algebraic Method, Simplex Method of solving Linear Programing Model c. Excel modeling and Solver as tool for solving Linear Programming Problem d. Running Sum of Forecasting Error (RSFE) and, Forecaster's Bias e. Stationary and Non-stationary Time Series	**[20]**	**CO4**
	SECTION C (Answer any two Questions)		
3.	What are the main features of a situation which can be modeled as a Linear Program (Marks-05)? What are - Contribution Coefficient, Technology Coefficient and Resource (Marks-06)? What are the variations of a Linear Program (Marks-04)?	**[15]**	**CO4**
4.	Refer to Weber's Least Cost Theory for location of a manufacturing facility. What is the transportation cost function for weight-gain and weight-loss products (Marks-07)? What role labour and agglomeration cost play in deciding the facility location (Marks-05)? What are the assumptions (Marks-03)?	**[15]**	**CO4**
5.	Given location longitude and latitude of a number of sources of various capacity and markets of various demands, what is the basis of deciding the location of the break bulking and consolidation warehouse (Marks 05)? What are the assumptions (Marks-05)? Determine the location of a warehouse given the following (Marks 05).	**[15]**	

Customer/ Source City	(x, y) Coordinates	Throughput	Customer/ Source City	(x, y) Coordinates	Throughput
A	(5, 12)	2,000	D	(3, 9)	15,000
B	(7, 8)	10,000	E	(15, 4)	6,000
C	(12, 10)	4,000	F	(7, 15)	8,000

	SECTION D		
6.	Factor Rating is a method used to evaluate the candidate city for the location of a facility in terms of both, cost and non-cost criteria. In this method - FIRST, various criteria for decision making is solicited from a group of informed individuals. How exactly it is done (Marks-05)? NEXT, weights for each criterion are calculated by calculating the frequency distribution. How exactly it is done (Marks-05)? In case the weights appear to be unrealistic, say – range is too small etc., what alternate methods will you use and why (Marks-05)? NEXT, each candidate location is ranked for each factor. How exactly, it is done (Marks-05)? FINALLY, the city for the location is decided. How exactly it is done (Marks-05)? Given the following data for three candidate locations for a facility what is your suggestion for the location (Marks-05)?	**[30]**	

Weights	Deciding Factors	City's Score of the Factor		
		Rishikesh	Haridwar	Dehradun
0.20	Transportation Cost	100	40	90
0.15	Labour Cost	100	60	80
0.25	Risk/Security Cost	80	80	60
0.30	Approach to Warehouse	70	90	60
0.10	Local Taxes	80	100	50