DR. D Y PATIL VIDYAPEETH

PUNE – 411018

CENTRE FOR ONLINE LEARNING

PIMPRI, PUNE

SYLLABUS FOR

MASTER OF BUSINESS ADMINISTRATION (M.B.A)

Academic Year 2025

Semester-III Logistics, Material & Supply Chain Management Specialization

Semester	3	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM301			**Type**	Specialization Course
Course Title	Logistics & Supply Chain Management (LSCM)				

Course Description:

This course is designed to explain the basic theory and techniques of Supply Chain Management (SCM) to examine the issues and problems associated with SCM in changing the business environment and to show how SCM can improve an enterprises effectiveness and competitiveness.

Course Objectives:

1) To understand the importance of SCM;
2) To know the various aspects of SCM; and
3) To study the current trends in SCM.

Course Outlines:

Unit 1: Introduction to Supply Chain Management: The Management Concept and Evolution of SCM, What is SCM? The Basic SCM Model, Relationships in SCM, Significance of SCM, Case Studies, Fundamentals of Logistics Management.

Unit 2: Fundamentals of Supply Chain Management: Decision Phases in Supply Chain, The macro processes of Supply Chain, Push-Pull based SCMs, Morkov Chain, Different types of Logistics, SCM in Indian Industry, Reverse SCM and Logistics, and Other Related Topics.

Unit 3: Inventory Control Management and Supply Chain Management: Need for Holding Inventory, Types of Inventories, Inventory Under Conditions of Uncertainty, Symptoms of Poor Inventory Management, Significance of Inventory Control Management, Inventory Control Organization, Duties of Inventory Control Department, Conducting Inventory– Methods of Inventory Control, Selective Inventory Control, Inventory Management in India, Inventory Ratios, Service Level, Understocking and Overstocking Costs.

Unit 4: Economic Order Quantity: The Economic Order Quantity [EOQ], The Derivation of EOQ, Standard Deviation, Practical Inventory Systems, Methods of Computation of EOQ, Cost Sensitivity

Analysis, Integrated EOQ-ABC Analysis, Economic Purchase Quantity, Practical Considerations of EOQ in terms of Rate of Receipt and Rate of Usage, Additional Problems on EOQ.

Unit 5: Stores Management and Supply Chain Management: Duties of the Store Officer, Interdepartmental Relations, Corporate Policy, and Stores Management, Types of Stores, Warehouses, Store Organization, Store Layouts, Features of Good Store Keeping, Safety Measures, Training.

Unit 6: Stores in Supply Chain: Care of Materials, Features of Ideal Storage Equipments, The Storage Equipments, The Store Records, The Store Reports, The Store Ratios, The Store Audit, Disposal, Replacement Analysis.

Unit 7: IT Enabled Supply Chain: Types of SCM Software, Macro-Processes CRM, ISCM and SRM, Transaction Management with EDI, Supply Chain IT in Practice, E-Business and Supply Chain, E-Sourcing, Data Requirements from SCM, Legacy Systems.

Unit 8: Material Handling and Transportation: Significance of MHT, Functions of MHT Management, Factors Influencing Transport Decisions, Various Modes of Transport, Design Options, Transportation During Trade-Offs, Routing and Scheduling, Material Handling, Material Handling Ratio, Principle of Unit Load and Concept of Containerization and Palletization, Containerization, Transportation Techniques, Material Handling Equipments, Traffic Management, Total Cost of Transport, Insurance Management.

Unit 9: Strategic Fit: Implied Demand Uncertainty, Understanding the Capabilities of Supply Chain, Other Issues Affecting Strategic Fit, Drivers and Obstacles, Decision Making in Supply Chain, Designing Supply Chain Distribution Network, Design Patterns of Distribution Network.

Unit 10:Network Design in Supply Chain: Factors Affecting Network Design, A Framework for Network Design Decisions, Taking Supply Chain Decisions Under Uncertain Conditions, Forecasting Demand, Methods of Forecasting, Role Played by Aggregate Planning, Action Plan, Strategy, Aggregate Planning Implementation, Managing the Supply, Implementing Solutions.

Unit 11: Manufacturing and Supply Chain Management: Product Life Cycle, Item Management, Kanban Systems, Assembly Line, Basic MRP Logic.

Unit 12: Channels of Distribution: Functions Performed by Distribution Channel, Services to the Customer, Vertical Marketing Systems [VMS], Horizontal Marketing Systems [HMS], Multi-Channel Marketing Systems [MMS], The Internet, Distribution Channel Design, Factors Affecting Choice of Distribution Channel.

Unit 13: International Logistics: International Shipping, Multimodal Transport, Air Transport.

Unit 14: Advanced Topics in Supply Chain Management: Customer Relationship Management (CRM), Electronic Data Interchange (EDI), Business Telecommunication, Electronic Supply Chain Management (eSCM), Supply Chain Software, Digital Content Management, Business Process Re-engineering (BPR), Decision Support Systems and SCM

Course Outcomes:

On successful completion of the course the learner will be able to:

CO#	Cognitive Abilities	Outcomes
CO301.1	**Remember**	Learn the importance of supply chain management.
CO301.2	**Understand**	Understand the basic concepts of supply chain management.
CO301.3	**Analyze**	Exhibit current trends in supply chain management.
CO301.4	**Apply**	Apply skills to implement various aspects of supply chain management.

Suggested Reading:

1. Oracle e-Business Suite, Manufacturing and Supply Chain Management Oracle Press
2. Manufacturing Planning and Control for Supply Chain Management, F. Robert Jacobs, William Berry, D. Clay Whybark, Thomas Vollmann, McGraw-Hill Professional Publishing
3. Manufacturing, Planning and Control Systems for Supply Chain Management, William Berry, D. Clay Whybark, Thomas Vollmann McGraw-Hill Publishing
4. Manufacturing Operations and Supply Chain Management – ALean Approach, David H. Taylor, David Brunt Cengage Learning Publishing
5. Supply Chain Design and Management: Strategic and Tactical Perspectives, Manish Govil, Jean-Marie Proth Academic Press

Semester	3	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM302			**Type**	Specialization Course
Course Title	Production Planning & Control				

Course Description:

To develop a broad conceptual framework based on the research, which has been done in the recent past, and to bridge the gap between the theoretical solutions on one hand and the real-world problems on the other in production planning and control.

Course Objectives:

1) To understand the various components and functions of production planning and control such as work-study, product planning, process planning, production scheduling, inventory control; and
2) To know the recent trends like Manufacturing Requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

Course Outlines:

Unit 1: Understanding the Project: Introduction to Project, Projects in Different Fields, Classification of Projects, Project Classification Based on Nature of Project, Characteristics of Project.

Unit 1: Production Planning and Control: Production Control, Role of Production Planning and Control, Objectives of Production Planning and Control, Significance, Functions, Factors Affecting Production Planning and Control, Symptoms of Poor Production Planning and Control, Organisation for PPC Function, Manufacturing Planning and Control, Measurement of Effectiveness, Production Planning and Control in Services.

Unit 2: Demand Management: Functions, Demand Planning, Demand Forecasting, Forecasting Techniques, Bullwhip Effect, Strategies for Demand Fluctuations, Demand Management in Services.

Unit 3: Sales & Operations Planning (SOP): Features, Objectives and Functions, Benefits, Process of SOP, Requirements for implementation, Implementation of SOP, Key Indicators of a Successful SOP

Unit 4: Capacity Planning: Meaning of Capacity, Types of Capacity, Capacity Management, Capacity Shortage, Factors Affecting Capacity, Capacity Planning, Capacity Planning, and Product Life Cycle, Capacity Expansion Strategies.

Unit 5: Aggregate Planning: Capacity and Demand Balance, Aggregate Planning Strategies, Steps in Aggregate Planning, Use of QT in Aggregate Planning, Aggregate Planning in Services, Trends in Aggregate Planning.

Unit 6: Master Production Schedule: Objectives of the MPS, MPS and Production Plan, Key Terms in MPS, Output of MPS, Steps in MPS, Time Fences and Time Zones, Changing MPS, Evaluation of MPS.

Unit 7: Material Requirement Planning Schedule: MRP System, MRP Process, Lot Sizing Rules, MRP Computations, Regeneration, and Net Change, Assumptions in MRP, Benefits of MRP, MRP Implementation, Software for MRP.

Unit 8: Production Activity Control: Concept of Production Activity Control, Functions of Production Activity Control, Role of Shop Planner, Information and Documents, Operations Scheduling, Loading, Sequencing, Dispatching, Input/Output Control.

Unit 9:High Volume Production Activity Control: Types of Production, Flow Production, Characteristics of Flow Production, Requirements of Flow Production, Planning and Control In Flow Production, Line Balancing, Terminology in Line Balancing, Line Balancing Methods, Line Balancing Procedure, Kilbridge and Wester method.

Unit 10: Job Shop Production Activity Control: Job Production, Characteristics of Job Shop Production, Complexity of Job Shop, Production Activity Control in Job Shop, Terminology in Job Shop Planning, Job Shop Scheduling, Sequencing Rules, Gantt Chart, Approaches to Job Shop Scheduling.

Unit 11: Sequencing Models: Meaning of Sequencing, Taxonomy of Sequencing Models, General Assumptions in Sequencing, Priority Rules for Job Sequencing, Factors Affecting Sequencing, Sequencing in Flow Shop, Johnson's Method, N Jobs- Three Machines Sequencing, Sequencing in Job Shop.

Unit 12: JIT and Kanban: Concept of JIT, Philosophy of JIT, Elements of JIT, JIT Purchasing, Application of JIT, Benefits, Limitations of JIT, Concept of Kanban, Objectives, and Functions of Kanban, Dual Card Kanban, Pull System, Principles of Implementation.

Unit 13: Project Scheduling: Characteristics of Project, Project Scheduling, Gantt Chart, Network Scheduling, PERT/CPM, Probabilistic Activity Time, Precedence Diagramming Method (PDM), Critical Chain Scheduling.

Unit 14: PPC in Service Industry: Characteristics of Service Business, Differences Between Service and Manufacturing, OPC in Service Industry, Effect of Poor Planning in Service Industry, OPC in Logistics Operations, Operation Planning in Entertainment Business, Operations Control at Air France, OPC in IT Industry, OPC in Health Care.

Course Outcomes:

On successful completion of the course the learner will be able to:

CO#	Cognitive Abilities	Outcomes
CO302.1	**Remember**	Learn basic concepts of production planning & control.
CO302.2	**Analyze**	Exhibit recent trends of manufacturing requirement planning.
CO302.3	**Evaluate**	Easily implement 5 M concept into practice.
CO302.4	**Apply**	Implement various components and functions into practice.

Suggested Reading:

1. Thomas E Vollman, William L Berry, D Cay Whybark and F Roberts Jacob MANUFACTURING PLANNING AND CONTROL FOR SUPPLY CHAIN MANAGEMENT, Tata McGraw–Hill Publishing Company Ltd (2005)
2. Daniel Sipper, Robert L, Bulfin, Jr. PRODUCTION PLANNING, CONTROL, AND INTEGRATION McGraw-Hill Companies Inc.
3. Seetharama L Narsimhan, Dennis W McLeavy, Peter J Billington PRODUCTION PLANNING AND INVENTORY CONTROL Prentice-Hall Of India Pvt Ltd, New Delhi (2003)
4. Landvater Darryl V WORLD-CLASS PRODUCTION AND INVENTORY MANAGEMENTJohn Wiley and Sons, New York 1997
5. H J Zimmermann, M G Sovereign QUANTITATIVE MODELS FOR PRODUCTION MANAGEMENT Englewood Cliffs N J: Prentice Hall 1974

Semester	3	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM303			**Type**	Specialization Course
Course Title	Inventory Management & MRP Systems				

Course Description:

This course emphasizes inventory control management for production planning and includes topics in inventory control with known and unknown demand, forecasting, lot sizing, dispatching, scheduling, and materials requirement planning (MRP), just-in-time models, and pull control systems, and aggregate planning.

Course Objectives:

1) To know roles and responsibilities of inventory managers and how to improve customer service through inventory management.
2) To understand the concept the objectives and importance of MRP
3) To understand and describe the various MRP system outputs
4) To understand the management issues in independent demand inventories

Course Outlines:

Unit 1: Elements of Inventory Management: Concept of Inventory, Pressures for Low Inventory and High Inventory, Role of inventory in operations, Types of inventory – seasonal, decoupling, cyclic, pipeline, Safety stock. Inventory costs - carrying cost, ordering cost, shortage cost, holding cost

Unit 2: Inventory Control systems: Continuous Review (Q) systems, Periodic Review (P) systems, ABC Classification system, Issues in the P and Q systems of inventory control.

Unit 3: Economic Order Quantity Models: The Basic EOQ Model, Production Quantity Model, Computer Solution of EOQ model with MS Excel, Quantity Discounts, Computer Solution of Quantity Discounts model with MS Excel, Reorder Point, Safety Stocks, Service Level, Reorder point with variable demand, Computer Solution of Reorder point with MS Excel, Order quantity for periodic inventory system, Order quantity with variable demand, Computer Solution of fixed period model with MS Excel.

Unit 4: Just-In-Time: Principles of just-in-time, Core logic of JIT, Main features for stocks, Achieving just-in-time operations, other effects of JIT, Benefits, and disadvantages of JIT, Comparison with other methods of inventory management. KANBAN as a control tool. Vendor-managed inventory.**Unit 5: Make Or Buy Decisions:** Factors influencing Make Or Buy Decisions-cost, quality, capacity core v/s noncore,

management strategy. Evaluation of performance of Materials function: cost, delivery, quality, methodology of evaluation, Use of ratios - inventory ratios, inventory analysis like ABC, FSN: Fast slow, Non-moving, HML-High Medium, Low, XYZ. Materials Management in JIT Environment

Unit 6: Dynamic Inventory Problems under Risk: General characteristics, Types of inventory control systems with known stock-out costs and service levels, Approximate and exact methods for safety stock determination.

Unit 7: Material Requirements Planning (MRP): An Overview of MRP, Objectives of MRP, Importance of MRP, MRP Logic, MRP System Inputs, MRP Processing, MRP System Outputs, Building Blocks of the MRP, Multiple Levels in Products, Product Structure Tree, Bill of Materials, Time Phasing Requirements and Incorporating Lead-Time Information, Determining Lot Size, Basic MRP Record and Record Processing, Safety Stock and Safety Lead-Time, Advantages and Limitations of MRP, ERP and its Significance in Inventory Management

Unit 8 : MRP, MRP-II and DRP: short comings of MRP, Design of MRP system and its variants (MRP-II and DRP).

Unit 9: Inventory-Related Issues and Costs: Management Issues in Independent-demand Inventories, Routine Inventory Decisions, Measuring Inventory System Performance, Deciding Timing Implementation, Different Inventory Costs, Order Preparation Costs, Inventory Carrying Costs, Shortage and Customer Service Costs, Incremental Inventory Costs.

Unit 10: JIT-based Approaches for Materials Management: Concepts and Issues, Relationship with Lean Engineering practices, Design of JIT-based inventory management systems.

Unit 11: Basics of Purchasing Management: Fundamentals & importance of industrial purchasing, Types of purchasing, Related techniques (non-quantitative & quantitative) in purchasing, Measurement & evaluation of performance of suppliers & purchasing systems.

Unit 12: Theory of Constraints and Materials Management: Concept and Issues, Bottleneck and non-bottleneck resources, Process and transfer batches, Capacity constraint resources, D-B-R scheduling, and VAT plants, Effect on materials management.

Course Outcomes:

On successful completion of the course the learner will be able to:

CO#	Cognitive Abilities	Outcomes
CO303.1	**Remember**	Define The Key Terms Associated With Inventory Management.
CO303.2	**Understand**	Classify Various Types Of Inventory, And Inventory Costs
CO303.3	**Apply**	Calculate Economic Order Quantity And Stock Levels Under Various Conditions.
CO303.4	**Analyze**	Compare And Contrast Various Methods Of Inventory Control
CO303.5	**Evaluate**	Assess Various Factors Influencing Make Or Buy Decisions.

Suggested Reading:

1. Mercado, E. (2007). Hands-On Inventory Management. New York: Auerbach Publications.
2. Muckstadt JA, Sapra A. (2010). Principles of Inventory Management: When You are Down to Four, Order More. Springer: New York, NY.
3. Wild, T. (2002). Best Practice in Inventory Management. London: Routledge.
4. Just-in-Time Manufacturing by Korgaonker, Macmillan
5. Nahmias, S. (2008). Production and Operations Analysis. McGraw-Hill/Irwin. Sixth edition.

Semester	3	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM304			**Type**	Specialization Course
Course Title	Packaging and Distribution Management				

Course Description:

The course will train learners over the complete cycle of distribution of goods from supplier to customer. This program wants to be recognized as highest standard for packaging and distribution managerial skills and capacity building for Logistics.

Course Objectives:

1) Learning to design packaging utilizing different materials: metal, glass, plastic, paper, and corrugated
2) Analyze and solve technical problems in packaging manufacturing through the application of packaging engineering principles
3) Develop an understanding of logistics operating areas and their interrelationship
4) Understand the importance and implications of a customer-focused logistics strategy

Course Outline:

Unit 1: Packaging/Packing Materials & Components: Various Materials/Metals Flexible, Folding, Insulated, Corrugated Packing Materials-Packing materials: Paper, Wood, Adhesive, Aluminium foil, Cushioning-stuff, Packaging gas, Pallet, Paperboard, Plastic wrap, Shrink wrap, Screw cap, Slip sheet-Security printing- Stretch wrap – Time-temperature indicator- Tinplate.

Unit 2: Packaging Industry Process and Machining: Packaging Demands of Consumer goods Industry-Packaging Demands of Industrial Users-Technology Trends in Packaging Industry – Aseptic processing - Authentication -Automatic identification and data capture - Blow fill seal - Blow moulding - Containerization -Electronic article surveillance -Graphic Design -Induction sealing - Plastic welding - Printing

Unit 3: Packing and Packaging: Meaning, Functions, and Essentials of Packing- Packaging: Meaning, Functions, and Essentials of Packaging- Difference between Packing and Packaging-Packing for Storage-Packing for Overseas Shipment- Packing for Inland Transportation- Packaging for Product content

Protection - Test of packaging: Mechanical, Climatic & Lab test- International Care labeling code - Packaging cost.

Unit 4: Packaging Types: Primary, Secondary and Tertiary- Requirements of Consumer Packaging, Channel Member Packaging, and Transport Packaging - Shrink packaging – Identification codes, bar codes, and electronic data interchange (EDI)- Universal Product Code- GS1 Standards- package labels- Symbols used on packages and labels Heavy, Medium and small Packaging- Active packaging-Child-resistant packaging Pilfer/Tamper Evident/Proof Packaging-Product-Packaging compatibility- Parma Packaging- Food Packaging- Electronic goods Packaging- FMCG packaging- Heavy engineering Goods/Equipment Packaging.

Unit 5: Packing Considerations: Protection, Convenience, Environment, Use/Re- use- Cost and Competition – Packing as a systems approach to Logistics- Transport/Storage Requirements- Physical, Chemical Environmental, Biological Nature of the Products Packing as Protection Against Hazards-

Package design considerations: Structural design, marketing, shelf life, quality assurance, logistics, legal, regulatory, graphic design, end-use, environmental factors- Packaging for Marketing and Visual Appeal- Biodegradation -Recycling: Glass, Plastic &Paper-Reuse- Sustainable packaging - Waste management.

Unit 6: Packaging Economics: Packaging Cost Vs Product cost- Cost Reduction in Packaging Packing for Inventory Control, Value Analysis- Packing and Value Engineering Packaging Laws-Consumer Protection in Food Packaging, Marking and Labeling, Ecofriendly Packaging for Exports- Scientific Packaging- Standardization in Packaging.

Unit 7: Quality assurance: Radio-frequency identification, Track and trace -Vacuum forming Verification and validation - Barcode printer - Barcode reader -Bottling line –Carton machine- Check weighed - Conveyor system -Heat gun - Heat sealer - Industrial robot Injection molding machine –Logistics automation

Unit 8: Distribution: Definition – Need for physical distribution – functions of distribution – marketing forces affecting distribution. The distribution concept – System perspective. Physical distribution trends in India. Transportation: Scope – principles of transportation function – relationship of transportation to other business functions

Unit 9: Channels of distribution: role of marketing channels– channel functions channel structure designing distribution channel – choice of distribution channel factors affecting. Intermediaries: functions of intermediaries – types of intermediaries – variables in selecting channel members – motivating – training – evaluating channel members – modifying channel arrangements

Unit 10: Transportation management: Legal types - Modes of transportation – Transport mode selection –methods – transport costs –rate profiles–transport regulations– intra and interstate transport of goods. Transport Industry in India - International Transport – Rail ways, Road transport, Ports – Transport Security - Trends in Modern Transport

Unit 11: Order processing and Unitization: Defining Order Processing – order acquisition – order entry– document processing – status reporting – factors affecting processing time – Customer service. Unitization –functions of Packaging – concept of unitization – Palletization Containerization– Costs of packaging – designing a package – packaging materials – choosing right materials – Contain in India.

Unit 12: Distribution control & Evaluation: Distribution control – stages of control process – standards & goals–performance report - measurement – monitoring – corrective action. Organization for Distribution: Distribution Organization structure – Private & Public organizations - conflict resolution – Rising costs& need for control – complexities of physical distribution. Transport organization: Functions –structure – hierarchy – Transport & Logistics organizations.

Course Outcome:

On successful completion of the course the learner will be able to:

CO#	Cognitive Abilities	Outcomes
CO304.1	**Remember**	Describe the role of packaging & distribution in the operations industry
CO304.2	**Understand**	Formulate logistics strategies from a supply chain network perspective
CO304.3	**Analyze**	Analyze the level of uncertainty associated with the supply of products and services to targeted customer segments and justify the choice of a supply chain strategy and its fit with competitive strategy.
CO304.4	**Apply**	Evaluate logistics supply chain networks and strategies.

Suggested Reading:

1. Alan Ruston, Phil Crouches, Peter Baker. (2014)
2. The Handbook of Logistics and Distribution Management:kogan page India New Delhi. D K Agrawal. (2007).
3. Distribution and Logistics Management: A Strategic Marketing Approach: Macmillan publishers. India. Kapoor Satish K &KansalPurva.(2003)
4. Basics of Distribution Management: A Logistical Approach: Prentice HALL of India.

Semester	3	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM305			**Type**	Specialization Course
Course Title	World Class Manufacturing				

Course Description:

Consistent with the Shingo Principles of continuous improvement, the World Class Manufacturing (WCM) training program is designed to train individuals to improve employee morale, individual and company performance, and company profits at all levels of the organization by highlighting the value and non-value added activities.

Course Objectives:

1) To help students understand the global competitive environment being faced by manufacturers;
2) To help students to know the impact of IT revolution on manufacturing competitiveness;
3) To help students understand the different international practices & models adopted by various organizations;
4) Understand various practices being taken up by Indian Industries; and
5) To help students know about the maintenance management practices.

Course Outline:

Unit 1: Overview of "World Class Manufacturing": Common characteristics of WCM, World-Class Organization of Future, What it Takes to Stay World Class?, Emergence of "World Class" Concept, Case Studies.

Unit 2: Vision, Mission, Values, Business & Manufacturing Strategies: Mission Statement, Vision Statement, Values, Interrelationship Between Values, Mission, and Vision, Strategy, Vision, Mission, Competitive Advantage, Business Strategy, Manufacturing Strategy, Current Issues.

Unit 3: Organization Design, Human Resources, Technology, and Performance Measurement: Organization Design, Human Resource, Technology, and Performance Measurement

Unit 4: Information Systems, Management Direction, and Operations Capabilities: Information Systems, Management Direction, Operating Model, Operating Capabilities.

Unit 5: Quality: 'Quality', Total Quality Control, Quality Planning, Quality Control, Quality Improvements, Total Quality Management (TQM)

Unit 6: Customer Service: What is Customer Service?, Essentials of Customer Service, A Few Basic Rules About Customer Service, Tips for Better Customer Service, Finer Points of Excellent Customer Service, Secrets of Customer Service, Five Customer Service Trends You Can't Ignore, Customer Service Skills, Customer Relations Management (CRM), CRM for Small Business, Companies Known for Their Extraordinary Customer Service.

Unit 7: World Class Manufacturing: History of World Class Manufacturing, World Class Manufacturing Philosophy, World-Class Manufacturing Defined, Changing Scenario in Manufacturing, Framework for Continuous Improvement, Imperatives for Increased Productivity, Opportunities for Improvement, Actual Company Performance Improvements, Examples of World Class Manufacturing Firms.

Unit 8: Product and Process Design: Product, Product Design, R&D Strategies, Modern Approaches to Design & Development, Process, Process Analysis, Process Capability.

Unit 9: Waste Elimination: What is "Waste", Seven Wastes, Definition of 'Waste', Five 'S', Flexible Workforce, Equipment Maintenance, Total Productive Maintenance (TPM), Statistical Process Control (SPC), Poka Yoke, Reduced Set up Time, Just-In-time (JIT), Three 'Ms' (Muda, Mura, Muri).

Unit 10: Lean Six Sigma: Lean Manufacturing, Six Sigma, Execution Infrastructure for Lean Six Sigma Applications, Software used for Six Sigma, Tools for Lean Six Sigma.

Unit 11: Toyota Production System (TPS): History, Underlying Principles of TPS, The 14 Principles, Essential Features of TPS, Techniques used in TPS.

Unit 12:Contributions of Experts To WCM: Dr. Edward Deming, Seven Deadly Diseases, Quotations and Concepts of Deming, Philip Crosby, Shigeo Shingo, Kaoru Ishikawa, Michael Porter, Case Study:- The Silicon Valley Case, Value Chain, Four Corners Model, C. K. Prahlad, Stephen Covey, Peter Senge.

Unit 13: Modern Techniques: Theory of Constraints (TOC), Synchronous Manufacturing, Business Process Reengineering (BPR), Benchmarking, Knowledge Management, Game Theory, Flexible Machining System.

Course Outcome:

On successful completion of the course the learner will be able to:

CO#	Cognitive Abilities	Outcomes
CO305.1	**Remember**	Learn the global competitive environment.
CO305.2	**Understand**	Differentiate the role of IT and Manufacturing competitiveness.
CO305.3	**Analyze**	Exhibit international projects and techniques.
CO305.4	**Apply**	Apply the skills to implement maintenance management practices.

Suggested Reading:

1. World Class Manufacturing: The Lessons of Simplicity Applied by Richard J. Schonberger,
2. Japanese Management Techniques: Nine Hidden Lessons in Simplicity. by Richard J. Schonberger,
3. Operations Strategy: Focusing Competitive Excellence (Quantitative Methods and Applied Statistics Series)by Peter W. Stonebraker and G. Keong Leong
4. Toyota Production System: Beyond Large-Scale Production by Taiichi Ohno
5. Manufacturing Strategy: Text and Cases- Terry Hill

Semester	3	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM306			**Type**	Specialization Course
Course Title	Statistics & Quantitative Techniques (SQT)				

Course Description:

Resources are always critical in any organization. They are unavailable in an unlimited manner and there are always constraints. Operation research is helpful in the situation of such constraints of resources. Managers have to manage limited available resources in such a way that neither production nor other activities get disturbed in the business. Facility design is a fascinating area for OR. The excitement of operation research lays in the application of quantitative techniques to real-world problems.

Course Objectives:

1) To impart knowledge in concepts and tools of OR and QT; and
2) To help students apply these tools in managerial decision-making.

Course Outlines:

Unit 1: Arranging Data to Convey Meaning: Presenting Data in Tables & Charts: Application Areas for Statistics, Statistical Methods, Understand Data, Organize and Classify Data, Graphical Representation of Data, Good & Bad Data Presentation.

Unit 2: Measures of Central Tendency – Mean, Median, Mode: Numerical Data Properties, Frequency, and Frequency Table, Summary Measures– Central Tendency.

Unit 3: Measures of Dispersion: Summary Measures– Variation.

Unit 4: Correlation Analysis: Correlation Analysis– Scatter Plots, Some Misconceptions About Correlation, Correlation Terminologies.

Unit 5: Simple And Multiple Regressions: Regression Analysis, Simple Regression, Multiple Regressions.

Unit 6: Association of Attributes: Notations, Classes and Class Frequencies, Relationship Between the Class Frequencies, Consistency of the Data, Independence of Attributes, Association of Attributes, Yules' Co-efficient of Association.

Unit 7: Probability & Probability Distribution: Notation and Terminology from Set Theory, Addition

Theory of Probability, Conditional Probability, Multiplication Theory of Probability, Applications of Bayes' Theorem, Binomial Distribution, Poisson Distribution, Normal Distribution.

Unit 8: Linear Programming: Formulation & Graphical Solutions to LPP: Variables, Constraints, Objective, Phases of an Operations Research Project, Linear Programming– Formulation Graphical Solutions to LPP.

Unit 9: Transportation: Mathematical Formulation of Transportation Problem, North-West Corner Rule, Lowest Cost Entry Method, Vogel's Approximation Method, Test for Optimization.

Unit 10: Assignment Problems: Mathematical Statement of Assignment Problem, Solution Method for Assignment Problem, Travelling Salesman Problem.

Unit 11: Queuing Theory: Single Server & Multi-Server: Analysing Queuing Process, Constituents of Queuing System, Service Facility, Queuing Discipline, Kendall Notations, Single Server Models, Multi-Server Models

Unit 12: Markov Chain: Monte Carle Simulation: Simulation Procedure, Application of Simulation.

Unit 13: Games Theory: Zero-Sum Games, Fundamental Principles of Game Theory, Reducing by Dominance, Saddle Point, Strictly Determined Game, Mixing Strategies, Flow of Solution, Assumptions for Games Theory.

Unit 14: Decision Theory: Criteria for Decision Making: Decision Tables, Decision Making Process, Decision Criteria for Certainty, Decision Criteria for Uncertainty [5 Criteria], Decision Criteria for Risk.

Course Outcomes:

On successful completion of the course the learner will be able to:

CO#	Cognitive Abilities	Outcomes
CO 304.1	**Remember**	Learn the basic concepts of operational research.
CO 304.2	**Apply**	Easily apply the tools in managerial decision-making.
CO 304.3	**Analyze**	Grab the opportunities in operation as a career.
CO 304.4	**Creating**	Easily do operational research for better growth.

Suggested Reading:

1. Taylor III. Bernard W., Introduction to Management Science, Dorling Kindersley (India) Pvt. Ltd., licenses of Pearson Education in South Asia, 9th Edition, 2008.
2. Vohra N. D., Quantitative Techniques in Management, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 3rd Edition, 2007.

Semester-IV Logistics, Materials and Supply Chain Management

Semester	4	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM 401			**Type**	Specialization Course
Course Title	Supply chain analytics				

Course Description:

This course showcases real-life applications of analytics in various domains of supply chain management, from competitive analysis and benchmarking, to selling, distribution and logistics, inventory management, sourcing and supply management, and to supply chain integration in a variety of industries. Learners learn to define the right data set, ask the right questions to drive supply chain efficiency and business value, and use the right models and tools to develop data-driven decisions.

Course Objectives:

1) To make the learners understand the basics of supply chain analytics.
2) To equip the learner's Basic analytical methods
3) To make learners understand How to apply basic probability models
4) To give learners insight of Statistics in supply chains
5) To make learners understand Formulating and solving optimization models

Course Outline:

Unit 1: Overview of Logistics and Supply Chain Management: Introduction, SCM and Competitive Advantage, Driving Forces in Business and SCM, Overview of Logistics Management, Overview of Supply Chain Management, Supply Chain Analytics

Unit 2: Overview of optimization Methods: Introduction and Historical Perspective, Constrained Optimization Models, Assumptions of an LLP, General Form of LLP, Graphical Solution to Furniture Problem, Simplex Method, A Few Examples of Formulation of LLP, Transportation Problem, Assignment Problem

Unit 3: Decisions in Warehousing: Introduction and Space Determination in Warehouse Planning, Warehouse Operations, and Layout Decisions, Handling Decisions, Layout Configuration Decisions.

Unit 4: Facility Locations and Discrete Location Models: Introduction, Single Facility Location Problems, Multiple Facility Location Problems, Mathematical Formulations of Popular Location Problems, Conclusion.

Unit 5: Facility Locations through Heuristic and Other Approaches: Introduction, Heuristic Methods, P-Median Solution for Example 4.1, Greedy Drop Heuristic for Capacitated Depots with Fixed Costs, Capacitated Fixed Charge Model Solution for Example 4.1, Mathematical Programming Approach to Facilities Location Problems, Baumol and Wolfe Method, Spatial Interaction Models.

Unit 6: Inventory Concepts, Costs and Basic Models: Introduction, Reasons for Keeping Inventory, Reasons against Keeping Inventory, ABC Analysis and Pareto Analysis (80-20 Rule), Managing Inventories and Inventory-Carrying Costs, Single-Period Inventory Models (Newsvendor Model), Optimal Stock Level in Newsvendor Models (for Continuous Distributions), Repetitive Order Quantities (Pull Models), Production Order Quantities (POQ) Models, Quantity Discount EOQ Models.

Unit 7: Inventory decisions under Uncertainty: Introduction, Factors Affecting Safety Inventory, Understanding Demand Uncertainty, Service Levels and Product Availability Measures, Average Inventory Level, Estimation of Unit Service Level or Fill Rate, Impact of Lead Time Uncertainty on Inventory Decisions, Backorder Case, Lost Sales Case.

Unit 8: Joint Replenishment and Lot Sizing in Inventory Decisions: Introduction and Inventory Investment Decisions, Lot Sizing Inventory Management Interpolation Technique, Lagrangian Multipliers, Joint Replenishment of Multiple Items, Lot-Sizing Techniques (Dynamic Lot Sizing), Multi-Echelon Inventory Decisions, Risk Pooling or Centralization of Inventories.

Unit 9: Trade-Off Decisions and Network Models in Transportation: Introduction, Basic Trade-Offs in Transport Decisions, Transport Service Selection, Operational Planning in Transportation, Network Models, Minimal Spanning Tree, Shortest Path Algorithms, Bellman-Ford Algorithm (for Negative Link Lengths), Floyd-Warshall Algorithm, Maximum Flow Model.

Unit 10: Routing Using the Traveling Salesman Problem Algorithms in Transportation: Introduction, Characteristics of Routing and Scheduling Problems, The Traveling Salesman Problem, Heuristics for Solving a TSP, Construction Heuristics, k-Opt Tour Improvement Method.

Unit 11: Routing and Scheduling Problems and Methods: Introduction, Vehicle Routing Problems, Branch and Bound Method for Solving Routing Problems, Clarke-Wright Savings Algorithm for Solving Routing Problems, Sweep Heuristic for Solving VRPs, Generalized Assignment Method, Vehicle Scheduling Methods, Deficit Function Approach to Vehicle Scheduling.

Unit 12: Multi-Criteria Decision Making: Introduction, Multiple-Attribute Utility Theory, Terminologies in MADM or MCDM Methods, Analytic Hierarchy Process, Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Basics of Fuzzy Logic, Fuzzy Analytic Hierarchy Process, Fuzzy TOPSIS.

Course Outcome:

On successful completion of the course the learner will be able to:

CO#	Cognitive Abilities	Outcomes
CO401.1	**Remember**	Learn supply chain analytics job opportunities, requirements, and preparation.
CO401.2	**Understand**	Understand the importance of the basics of Supply chain Analytics and Optimization
CO401.3	**Analyze**	Analyze the level of uncertainty associated with the supply of products and services to targeted customer segments and justify the choice of a supply chain strategy and its fit with competitive strategy.
CO401.4	**Apply**	Apply the knowledge of how analytics can be applied to various domains of a supply chain, from selling, to logistics, production, and sourcing, to generate a significant social/economic impact. You will also learn job market trends, job requirements, and preparation.

Suggested Reading:

1. Supply Chain Logistics Management, Donald Bowersox, David Closs, M Bixby Cooper, Tata McGraw Hill.
2. Operations Management, William J. Stevenson, TMGH.
3. Operations Management, Lee Krajewski, Larry Ritzman, Manoj Malhotra, Pearson Education.
4. Introduction to Materials Management, J.R. Tony Arnold, Stephen Chapman, Ramakrishnan, Pearson.

Semester	4	**Course Credits**	4	**Specialization**	Logistics & Supply Chain Management
Course Code	OMBLSCM 402			**Type**	Specialization Course
Course Title	Just in Time & lean.				

Course Description:

The journey of reducing waste, optimizing processes, and engaging your team starts here. Just-in-Time manufacturing (JIT), popularized by Toyota in the 20th century, remains the time-tested cornerstone of any lean organization. Its principles have lifted businesses out of crises and propelled them to heightened levels of profitability. Whether you are a lean sensei who is continuously learning or a beginner new to the world of lean manufacturing, this course is for you. While basic knowledge of lean is helpful, ultimately there are no prerequisites. The course is ideal for lean practitioners, operations managers, line supervisors, business leaders, and quality professionals alike who want to set a lean example. JIT manufacturing will improve your on-time delivery, reduce inventory, increase morale, and ultimately save costs.

Course Objectives:

1) To impart knowledge for facilitating the worker environment.
2) To identify hidden manufacturing wastes.
3) To impart knowledge on a systematic approach to implementing lean manufacturing practices

Course Outline:

Unit 1: Introduction to Just in Time (JIT): History and Philosophy of Just in time, Cultural Aspects, Just in Time (JIT) Approaches, Cycle Time Reduction, Waste Reduction, Flow Breakdowns, Scope of Just in Time (JIT), JIT Application Profile, Seven Wastes in JIT, Elements of JIT, People Involvement, Plants, Systems, Purchasing.

Unit 2: Goals, Benefits, and Limitations of JIT: Benefits of JIT, Limitations of JIT, Implementation of JIT Concept, Keys to Successful Implementation of JIT.

Unit 3: Understanding and Controlling Variation: Sources of Variation, Causes of Variation, Variability, Forms of Variability. Responses to Variability, Reducing Variability.

Unit 4: Introduction to Materials Requirement Planning: Push and Pull Systems, Need for MRP, Terms Used in Material Resource Planning (MRP), Prerequisites and Assumptions of MRP.