25UMET411	OPERATIONS MANAGEMENT	Category	L	T	P	R	Credit	Year of Introduction
		PEC	3	0	0	0	3	2025

Preamble: This course provides a comprehensive introduction to the strategic and operational aspects of Operations Management. It bridges the gap between high-level organizational strategy and the technical execution of production systems.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain the foundational concepts of operations management of different production systems.	K2 Understand
CO2	Determine plant location and layout using qualitative and quantitative techniques.	K3 Apply
CO3	Apply forecasting methods, inventory control models (EOQ), and aggregate planning strategies to optimize resource, capacity and demand management.	K3 Apply
CO4	Apply scheduling techniques and project management (CPM/PERT) to determine task sequences, project timelines, and basic lean requirements.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	1	-	1	-	1	-	1	-
CO2	2	3	3	2	2	-	-	-	-	-	1	2	3
CO3	3	3	2	-	1	-	-	-	-	-	2	1	2
CO4	3	3	3	-	2	-	-	-	1	-	3	1	2
Avg	**2.5**	**2.67**	**2.33**	**2.00**	**1.67**	**1.00**	**-**	**1.00**	**1.00**	**1.00**	**2**	**1.25**	**2.33**

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*			*		
CO2		*	*	*	*	*			
CO3		*	*	*		*		*	
CO4			*	*	*	*			*

WKs Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment : 15 marks

SYLLABUS

Module 1 (10 hrs)

Operations Foundations: Introduction and overview of operations management; operations function, strategy, and system concepts. Management & Organization: Management process—Mission, Goals, and Strategy; Principles of organization, delegation, and span of control. Organizational Structures: Types of organization structures and directing/leadership roles. Production Systems: Characteristics of job shop, batch, mass, and continuous production.

Product Development: Product Life Cycle (PLC); New Product Development and "Make or Buy" decisions. Design Concepts: Standardization, simplification, and diversification; Value Engineering and Ergonomics.

Module 2 (10 hrs)

Plant Location: Factors influencing plant location and location analysis techniques.

Location Evaluation: Factor rating, Center of Gravity technique, Load-distance technique, and Break-even analysis. Plant Layout: Objectives and classification of layouts (Process, Product, Fixed-position, and Cellular).

Layout Design Procedures: Systematic Layout Planning (SLP) and computational procedures like CRAFT, ALDEP, and CORELAP. Assembly Line Balancing: Objectives and methods including the Ranked Positional Weight Method and COMSOAL

Module 3 (10 hrs)

Demand Forecasting: Need and uses of forecasting, and components of demand like trends and seasonality. Quantitative Methods: Time series methods including Moving Average, Exponential Smoothing, and Linear Regression. Forecast Accuracy: Measuring accuracy and making seasonal adjustments.

Capacity Planning: Importance, types of capacity, and Capacity Requirement Planning (CRP). Aggregate Planning: Nature of aggregate planning, strategies, and heuristic methods. Inventory Control: Types of inventory and deterministic demand models like Economic Order Quantity (EOQ).

Module 4 (12 hrs)

Scheduling Fundamentals: Objectives, processing characteristics, constraints, and performance measures. Visual Tools: Use of Gantt charts for monitoring and control. Single Machine Scheduling: Applying the Shortest Processing Time (SPT) rule to minimize mean flow time and the Earliest Due Date (EDD) rule to minimize maximum lateness. Parallel Processors: Minimization of make span and mean weighted flow time using McNaughton's algorithm.

Flow Shop Scheduling: Extension of Johnson's rule for 3-machine problems and Palmer's heuristic. Project Management: Network diagrams and project scheduling using CPM and PERT. Lean Systems: Introduction to Just-in-Time (JIT), Kanban systems, and Material Requirements Planning (MRP-I & MRP-II).

Text Books:

1. Mahajan, M., *Industrial Engineering And Production Management*. Dhanpat Rai & Co., 2008.
2. Paneerselvam, R*., Production and Operations Management*. PHI Learning, 2012.
3. Telsang, M., *Industrial Engineering and Production Management*. S. Chand, 2006.

Reference Books:

1. Buffa, E. S., & Sarin, R. K*., Modern production/operations management* (8th ed.). John Wiley & Sons, 2007.
2. Heizer, J., & Render, B., *Operations management* (11th ed.). Pearson Education, 2013.
3. Nahmias, S., *Production and operations analysis* (6th ed.). McGraw Hill, 2008.
4. Russell, R. S., & Taylor, B. W., *Operations management*: Creating value along the supply chain (7th ed.). John Wiley & Sons, 2011.

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END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code	**25UMET411**
Course Name	**Operations Management**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**

1	Explain the principles of delegation and span of control in an organization.	3	1	L2
2	Distinguish between job shop and mass production systems, citing one example of each.	3	1	L2
3	Two candidate plant locations A and B are rated on two factors: labour availability (weight 0.6, rating A = 80, B = 70) and transportation cost (weight 0.4, rating A = 60, B = 85). Apply the Factor Rating method to find the better location.	3	2	L3
4	An assembly line has 4 tasks with element times of 2, 3, 1, and 4 minutes. For a desired cycle time of 5 minutes, compute the theoretical minimum number of workstations.	3	2	L3
5	The demand for a product over the last three months was 100, 120, and 140 units. Compute the forecast for the next month using the 3-month moving average method.	3	3	L3
6	A firm has an annual demand of 2,400 units, an ordering cost of Rs. 40/order, and a holding cost of Rs. 3/unit/year. Compute the Economic Order Quantity (EOQ).	3	3	L3
7	Four jobs have processing times of 6, 2, 9, and 4 minutes. Sequence the jobs using the SPT rule and compute the mean flow time.	3	4	L3
8	An activity has an optimistic time of 3 days, a most likely time of 5 days, and a pessimistic time of 11 days. Compute the expected time using the PERT formula.	3	4	L3
Part B (*Answer any one full question from each Module. Each carry 9 marks*)				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	Explain the various types of organizational structures (line, functional, and matrix) along with their merits and demerits. Discuss the role of management in establishing organizational mission, goals, and strategy.	9	1	L2
OR				
10	Describe the stages of the Product Life Cycle (PLC) and explain how “Make or Buy” decisions are taken at different stages. Discuss the significance of Value Engineering and Ergonomics in product design.	9	1	L2

<table>
<tr><th colspan="6">Module II</th></tr>
<tr><th>Qn No.</th><th>Question</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>11</td><td>A company is evaluating three potential plant locations (A, B, and C) based on four factors. The weights and ratings (out of 100) are given below. Apply the Factor Rating method to compute the weighted score for each location and recommend the best location.
<table>
<tr><th>Factor</th><th>Weight</th><th>Loc. A</th><th>Loc. B</th><th>Loc. C</th></tr>
<tr><td>Raw material availability</td><td>0.30</td><td>80</td><td>70</td><td>90</td></tr>
<tr><td>Labour availability</td><td>0.25</td><td>70</td><td>85</td><td>75</td></tr>
<tr><td>Transportation cost</td><td>0.25</td><td>60</td><td>80</td><td>70</td></tr>
<tr><td>Market proximity</td><td>0.20</td><td>90</td><td>60</td><td>80</td></tr>
</table></td><td>9</td><td>2</td><td>L3</td></tr>
<tr><td colspan="4">OR</td><td></td></tr>
<tr><td>12</td><td>An assembly line is to be balanced for the tasks, times, and immediate predecessors given below. Apply the Ranked Positional Weight Method to assign tasks to workstations for a cycle time of 10 minutes, and compute the line efficiency and balance delay.
<table>
<tr><th>Task</th><th>Time (min)</th><th>Immediate Predecessor</th></tr>
<tr><td>A</td><td>4</td><td>–</td></tr>
<tr><td>B</td><td>3</td><td>A</td></tr>
<tr><td>C</td><td>5</td><td>A</td></tr>
<tr><td>D</td><td>2</td><td>B</td></tr>
<tr><td>E</td><td>6</td><td>C</td></tr>
<tr><td>F</td><td>3</td><td>D, E</td></tr>
</table></td><td>9</td><td>2</td><td>L3</td></tr>
<tr><th colspan="6">Module III</th></tr>
<tr><th>Qn No.</th><th>Question</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>13. a</td><td>The demand for a product over the past five months is 210, 230, 220, 250, and 240 units. Using the Exponential Smoothing method with a smoothing constant $\alpha = 0.3$ and an initial forecast of 210 units, compute the forecast for each subsequent month.</td><td>5</td><td>3</td><td>L3</td></tr>
<tr><td>13. b</td><td>Explain how seasonal adjustments are incorporated into a demand forecast.</td><td>4</td><td>3</td><td>L2</td></tr>
<tr><td colspan="4">OR</td><td></td></tr>
<tr><td>14. a</td><td>A manufacturer has an annual demand of 9,000 units, an</td><td>5</td><td>3</td><td>L3</td></tr>
</table>

<table>
<tr><td></td><td>ordering cost of Rs. 120 per order, and a holding cost of Rs. 5 per unit per year. Determine the EOQ, the optimal number of orders per year, and the time between successive orders.</td><td></td><td></td><td></td></tr>
<tr><td>14. b</td><td>Explain the level strategy and the chase strategy used in aggregate planning.</td><td>4</td><td>3</td><td>L2</td></tr>
<tr><td colspan="5">Module IV</td></tr>
<tr><td>Qn No.</td><td>Question</td><td>Marks</td><td>CO</td><td>BL</td></tr>
<tr><td>15. a</td><td>Six jobs arrive at a single machine with the processing times given below. Sequence the jobs using the SPT rule and compute the mean flow time and the mean number of jobs in the system.
<table><tr><th>Job</th><th>J1</th><th>J2</th><th>J3</th><th>J4</th><th>J5</th><th>J6</th></tr><tr><td>Processing time (min)</td><td>5</td><td>8</td><td>3</td><td>10</td><td>2</td><td>7</td></tr></table></td><td>6</td><td>4</td><td>L3</td></tr>
<tr><td>15. b</td><td>Explain the Earliest Due Date (EDD) rule and its objective in single machine scheduling.</td><td>3</td><td>4</td><td>L2</td></tr>
<tr><td colspan="4">OR</td><td></td></tr>
<tr><td>16. a</td><td>The activities, durations, and precedence relationships of a project are given below. Draw the network diagram and determine the critical path and the project duration using CPM.
<table><tr><th>Activity</th><th>Predecessor</th><th>Duration (days)</th></tr><tr><td>A</td><td>–</td><td>4</td></tr><tr><td>B</td><td>–</td><td>6</td></tr><tr><td>C</td><td>A</td><td>5</td></tr><tr><td>D</td><td>B</td><td>3</td></tr><tr><td>E</td><td>C, D</td><td>7</td></tr></table></td><td>6</td><td>4</td><td>L3</td></tr>
<tr><td>16. b</td><td>Explain the basic concepts of Just-in-Time (JIT) and Kanban systems.</td><td>3</td><td>4</td><td>L2</td></tr>
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