MECHANICAL
ENGINEERING

Prepared By :

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Session 2023-24
Course File

8ME5-12: SUPPLY AND OPERATIONS MANAGEMENT

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(Assistant Professor)

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RAJASTHAN TECHNICAL UNIVERSITY, KOTA
Scheme & Syllabus
IV Year- VII & VIII Semester: B. Tech. (Mechanical Engineering)

8ME5-12: SUPPLY AND OPERATIONS MANAGEMENT

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introduction to operations management (OM), the scope of OM; Historical evolution of OM; Trends in business; the management process. Operations Strategy, Competitiveness and Productivity	4
3	Demand Forecasting: components of forecasting demand, Approaches to forecasting: forecasts based on judgment and opinion, Time series data. Associative forecasting techniques, Accuracy and control of forecasts, Selection of forecasting technique.	4
4	Product and Service design, Process selection, Process types, Product and process matrix, Process analysis.	5
5	Capacity Planning: Defining and measuring capacity, determinants of effective capacity, capacity strategy, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives; Cost-Volume analysis.	5
6	Facility Location: Need for location decisions, factors affecting location, qualitative and quantitative techniques of location. Facilities layout: Product, Process, Fixed position, combination and cellular layouts; line balancing. Material Handling	5
7	Planning levels: long range, Intermediate range and Short range planning, Aggregate planning: Objective, Strategies, and techniques of aggregate planning. Master scheduling; Bill of materials, MRP; inputs processing and outputs, and overview of MRPII , use of MRP to assist in planning capacity requirements, Introduction to ERP	4
8	Techniques of production control in job shop production, batch production and mass production systems. sequencing: priority rules, sequencing jobs through two work centers, scheduling services	4
9	Introduction to Just-in-time (JIT) and Lean Operations: JIT production, JIT scheduling, synchronous production, Lean operations system	4
10	Supply Chain Management (SCM): Need of SCM, Bullwhip effect, Elements of SCM, Logistics steps in creating effective supply chain, Purchasing and supplied management.	4
	Total	40

Course Overview:

This course introduces the viewer to the basics of Operations and Supply Chain Management. The concepts in Operations Management are restricted to the planning and operational decisions within an organization while the supply chain concepts are for a network of organizations. The main emphasis of the course is on the basic concepts and on quantitative modeling of the various decision problems.

Course Outcomes:

CO. NO.	Cognitive Level	Course Outcome
1	Synthesis	Summarize the fundamental operations concepts, key principles of its management, and relevant analysis approaches.
2	Synthesis	Develop the ability to understand a real-world unstructured problem, and gather necessary information and data to formulate into a structured problem
3	Synthesis	To develop quantitative and qualitative analysis framework and solution methods, and appropriately implement them to obtain meaningful solutions
4	Synthesis	Set up strengths and weaknesses of alternative solutions and obtain relevant managerial insights.
5	Synthesis	Setup Facilities Layout , Facility Location and Enhance Product Qulaity.

Prerequisites:

1. Basic knowledge of Industrial operations.
2. Concepts of Optimization and mathematics.

Course Outcome Mapping with Program Outcome:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Supply & Operations Management Year of study: 2021-22															
CO1	0	0	2	0	0	1	1	1	1	1	1	1	0	2	0
CO2	0	0	2	0	0	1	1	1	1	1	1	1	0	1	0
CO3	0	0	2	0	0	2	1	0	0	1	0	1	0	2	0
C04	0	0	2	0	0	1	1	0	1	1	0	1	0	1	1
C05	0	0	2	0	0	1	1	0	1	1	0	1	0	1	1
Average	0.00	0.00	2.00	0.00	0.00	1.25	1.00	0.50	0.75	1.00	0.50	1.00	0.00	1.50	0.25

Course Coverage Module Wise:

Lecture No.	Unit	Topic
1	1	**INTRODUCTION:** Students will know the objective, scope and outcome of the course.
2	2	**INTRODUCTION TO OPERATIONS MANAGEMENT (OM):**
3	2	Students will able to know the historical evolution of OM
4	2	Students will able to know trends in business; the management process
5	2	Students will able to know Operations Strategy, Competitiveness and Productivity
6	3	**DEMAND FORECASTING:** Students will able to know components of forecasting demand
7	3	Students will able to know approaches to forecasting: forecasts based on judgment and opinion, Time series data
8	3	Students will able to know associative forecasting techniques, Accuracy and control of forecasts
9	3	Students will able to know selection of forecasting technique
10	4	**PRODUCT AND SERVICE DESIGN:**
11	4	Students will able to know about process selection
12	4	Students will able to know about process types
13	4	Students will able to know the product and process matrix
14	4	Students will able to do process analysis.
15	5	**CAPACITY PLANNING:** Students will able to define and measure the capacity
16	5	Students will able to know determinants of effective capacity, capacity strategy
17	5	Students will able to know the steps in capacity planning process

18	5	Students will able to understand to determining capacity requirements, Capacity alternatives
19	5	Students will able to know about evaluation of alternatives; Cost-Volume analysis
20	**6**	**FACILITY LOCATION:** Students will able to understand the need for location decisions
21	6	Students will able to know the factors affecting location, qualitative and quantitative techniques of location
22	6	**FACILITIES LAYOUT**
23	6	Students will able to know the fixed position, combination and cellular layouts
24	6	Students will able to know the line balancing. Material Handling
25	**7**	**PLANNING LEVELS:** Students will able to know the long range, Intermediate range and short-range planning
26	7	**AGGREGATE PLANNING:** Students will able to know the objective, Strategies, and techniques of aggregate planning
27	7	**MASTER SCHEDULING;** Students will able to use the Bill of materials, MRP; inputs processing and outputs, and overview of MRPII
28	7	Use of MRP to assist in planning capacity requirements, Introduction to ERP
29	**8**	Students will able to know the techniques of production control in job shop production
30	8	Students will able to know the batch production and mass production systems
31	8	Students will able to know the sequencing: priority rules, sequencing jobs through two work centers
32	8	Students will able to schedule services
33	**9**	**INTRODUCTION TO JUST-IN-TIME (JIT) AND LEAN OPERATIONS**
34	9	Students will able to know the JIT production, JIT scheduling
35	9	Students will able to know synchronous production
36	9	Students will able to know the lean operations system
37	**10**	**SUPPLY CHAIN MANAGEMENT (SCM)**
38	10	Students will able to know the Bullwhip effect, Elements of SCM
39	10	Students will able to know the logistics steps in creating effective supply chain
40	10	Students will able to know the purchasing protocol and supplied management.

Text Books

1. Industrial Engineering and Management by O. P. Khanna, Dhanpat Rai Publications.

References

1. Stevenson, Operations Management, Tata Mcgraw Hill.
2. Roberta S. Russell, Bernard W. Taylor, Operations Management, John Wiley

Assessment Methodology:

1. Assignments one from each unit.
2. Midterm subjective paper where they have to solve fundamental questions with numerical from each unit. (Twice during the semester)
3. Final paper at the end of the semester subjective.

Teaching and Learning resources unit-wise:

Unit-1

Introduction to Operations Management

Video Tutorials: https://youtu.be/ZNLaoFdcCPs?list=PL040D2F9406691BE6

Theory concepts: https://nptel.ac.in/courses/110/106/110106045/

Unit-2

Demand forecasting

Video Tutorials: https://youtu.be/ZNLaoFdcCPs?list=PL040D2F9406691BE6

Theory concepts: https://nptel.ac.in/courses/110/106/110106045/

Unit-3

Product & Service Design

Video Tutorials: https://youtu.be/ZNLaoFdcCPs?list=PL040D2F9406691BE6

Theory concepts: https://nptel.ac.in/courses/110/106/110106045/

Unit-4

Capacity Planning & Facilities Layout

Video Tutorials: https://youtu.be/ZNLaoFdcCPs?list=PL040D2F9406691BE6

Theory concepts: https://nptel.ac.in/courses/110/106/110106045/

Unit-5

Aggregate Planning, Master Production Schedule & JIT System

Video Tutorials: https://youtu.be/ZNLaoFdcCPs?list=PL040D2F9406691BE6

Theory concepts: https://nptel.ac.in/courses/110/106/110106045/

Unit-6

Supply Chain Management

Video Tutorials: https://youtu.be/ZNLaoFdcCPs?list=PL040D2F9406691BE6

Theory concepts: https://nptel.ac.in/courses/110/106/110106045/

7E7015

7E7015
B. Tech. VII Sem. (Main / Back) Exam., Nov. – Dec. - 2018
Mechanical Engineering
7ME5A Operations Management

Time: 3 Hours   **Maximum Marks: 80**
                                                     Min. Passing Marks: 26

Instructions to Candidates:

Attempt any **five questions,** *selecting* **one question** *from each unit. All questions carry* **equal** *marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

UNIT- I

Q.1   Explain applications of Operations management. Discuss techniques of demand

forecasting.   [8+8=16]

OR

Q.1   Differentiate between:

   (a)   Time series methods Vs Regression methods   [4]

   (b)   Accuracy Vs Control of forecasts.   [4]

   (c)   Qualitative method of demand Vs Quantitative method.   [4]

   (d)   Statistical technique Vs Operations research techniques.   [4]

(b) Draw the network diagram from the following activities & number the events: [4]

(i)
Activity	A	B	C	D	E	F	G	H
Immediate Predecessors	-	-	A	A	B	B	D,E	F,G

(ii)
Activity	A	B	C	D	E	F	G	H
Immediate Predecessors	-	-	-	A,B	B,C	C	D	G,E,F

7E7015

B. Tech. VII Sem. (Main/Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME5A Operations Management

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

UNIT-I

Q.1 (a) Briefly describe the term operations management. Briefly discuss each of these terms related to the historical evolution of operations management: - [2+6=8]

    (i) Industrial Revoluation

    (ii) Scientific Management

    (iii) Interchangeable parts

    (iv) Division of labour

  (b) Explain scope of operations management & framework of managing operations. [4+4=8]

OR

Q.1 (a) Why is there a need of demand forecasting? Explain quantitative methods of forecasting. [2+6=8]

(b) An organisation records indicate that monthly sales for a 8 – month period are as follows:- [2+2+2+2=8]

Month	Jan	Feb	Mar	Apr	May	June	Jul	Aug
Sales ($\times 10^4$, unit)	20	19	18	15	20	18	22	20

(i) Forecast the sales for Sep using following –

(1) Linear trend equation

(2) A Five month moving average method

(3) A weighted average method using weight of 0.65 for Aug. 0.30 for July, & 0.15 for June.

(4) Exponential smoothing techniques using smoothing const. equal to 0.20 & assume a forecast for March as 19×10^4

UNIT-II

Q.2 (a) What do you understand by product & service? Explain process selection. Discuss different types of production systems with examples & layout. [2+2+4=8]

(b) Explain product process matrix & discuss process planning. Discuss various steps involved in process planning. [2+2+4=8]

OR

Q.2 (a) What do you understanding by capacity planning? Explain measurement of capacity planning & discuss determinants of effective capacity. [8]

(b) Classify capacity planning? Explain the steps involved in capacity planning process. [8]

UNIT-III

Q.3 (a) Describe the means of plant location & layout? Discuss the factors affecting plant location. [8]

(b) Write short note on material handling. [2]

(c) Assembly of a simple component involved 7 work elements. The following table gives elements time & operations precedence. Element time is in min. Time for a shift is 7 hour/day & total output units required are 300 units /day. [6]

Work element	1	2	3	4	5	6	7
Element time (Min)	1.24	0.78	0.54	0.28	1.12	0.7	0.54
Immediately precedence by element	-	1	2	3	3	4,5	6

Draw network diagram & calculate -
(a) Cycle time
(b) Balancing Efficiency
(c) Theoretical min. No. of work stations

OR

Q.3 (a) Define aggregate planning? What are variables used in aggregate planning? Explain aggregate planning strategies & guidelines. [2+2+4=8]

(b) What is the MRP? What are the input & output required by the MRP processing logic? Discuss objectives of MRP. [2+4+2=8]

UNIT-IV

Q.4 (a) What do you understand by production control? Discuss its functions. [2+6=8]

(b) Following table gives manufacturing time (in Min) of 8 Jobs to be processed on three machines M1, M2, M3 in order M1, M2, M3. Sequence the job using Johnson's method & find overall processing time. Find also waiting times of jobs & idle times of the three machines. [8]

Job	A	B	C	D	E	F	G	H
M1	13	18	21	20	16	27	22	12
M2	10	9	14	15	12	13	11	8
M3	16	19	23	24	19	25	23	15

OR

Q.4 (a) What do you understand by JIT? Discuss objectives & element of JIT approach. Explain supporting goals of JIT. [2+4+2=8]

(b) Write short notes on: [3+3+2=8]

(i) Lean operation system

(ii) KANBAN System

(iii) Synchronous production

UNIT-V

Q.5 (a) Describe supply chain management. Discuss need & elements of SCM.[2+3+3=8]

(b) Describe in detail purchase management & discuss objectives of purchasing with diagram. [4+4=8]

OR

Q.5 (a) Point out the difference between PERT & CPM. Explain how Float is calculated in PERT approach. What is crashing? [4+3+1=8]

(b) Consider a project for which the time estimates are given in table below. Construct the PERT network. What is critical path? Find the probability of completing the project before 23 days. [8]

Activity		1-2	1-3	2-3	2-4	2-6	3-4	3-5	4-5	4-6	5-6
Estimated (days) time	t_o	2	1	0	2	5	3	3	4	2	2
	t_m	5	4	0	4	7	5	6	6	5	6
	t_p	8	7	0	6	12	10	9	10	8	6